

UPPER LIMB

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- My best wishes
Dr_Khalid
Milad

VISIT...

LANZAROTE
Caliente.COM

-BREAST-

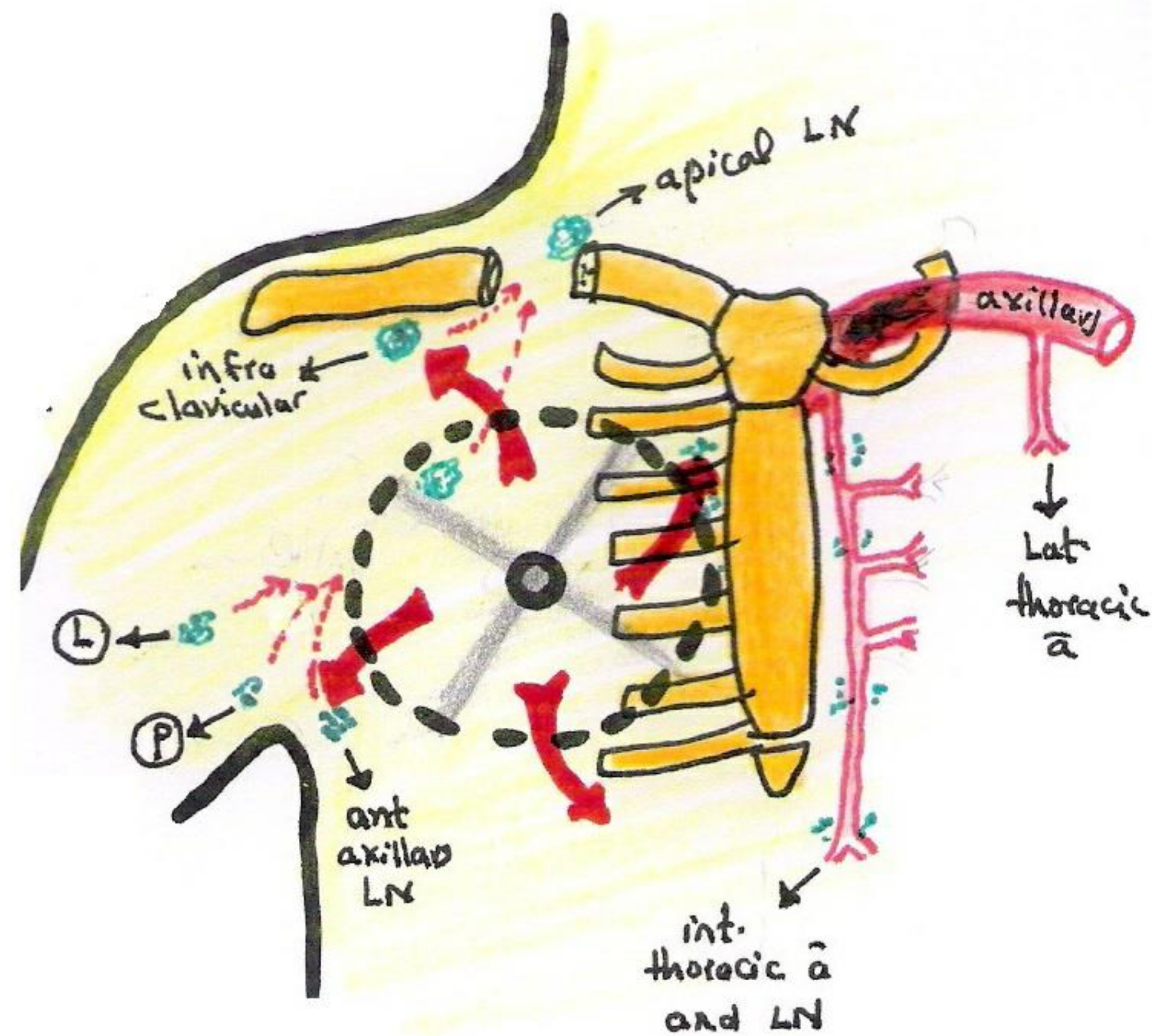
- The female breast (Mamma) is formed by the mammary gland (specialized accessory gland) secreting milk.

* Shape & Position :- Beast is a modified Sweat glands, or sudoriferous glands

- The breast is conical in shape with its base extending from the second to the sixth ribs and from sternum (lateral border) to the midaxillary line.
- Present in superficial fascia, except axillary tail [Pierces deep fascia at lower border of Pectoralis major & enters axilla].
- Musce bed of breast (muscles under it) are Pectoralis major (the main muscle bed) with serratus anterior & external oblique.
- Consists of 15-20 lobes separated by fibrous septa which is more developed in upper part ^{near skin} forming the Suspensory ligament ^(cooper's lig.).
- Breast is separated from the deep fascia under it by a layer of loose areolar tissue called Retromammary space.
- Each lobe is formed of acini (secreting milk) and transmits the milk by a lactiferous duct that opens into the nipple and before its end forms lactiferous sinus (ampulla), each lobe has one duct so there is 15-20 ducts in breast.

* Nipple & areola :-

- Nipple :- Lies opposite to 4th intercostal space but if large breast is lower., it has 15-20 opening.
- Areola :- is a dark pink brownish circular area surrounding the nipple that change to dark brown by melanin at First pregnancy for ever.
 - areola contains areolar sebaceous glands which is so large forming visible cutaneous tubercles.
- Both nipple & areola have no fat under its skin.



* Blood supply:-

- 1- Internal thoracic artery (Perforating branches of it).
- 2- Lateral thoracic artery.
- 3- Intercostal arteries.
- 4- thoracoacromial artery.

• veins corresponding to arteries n.

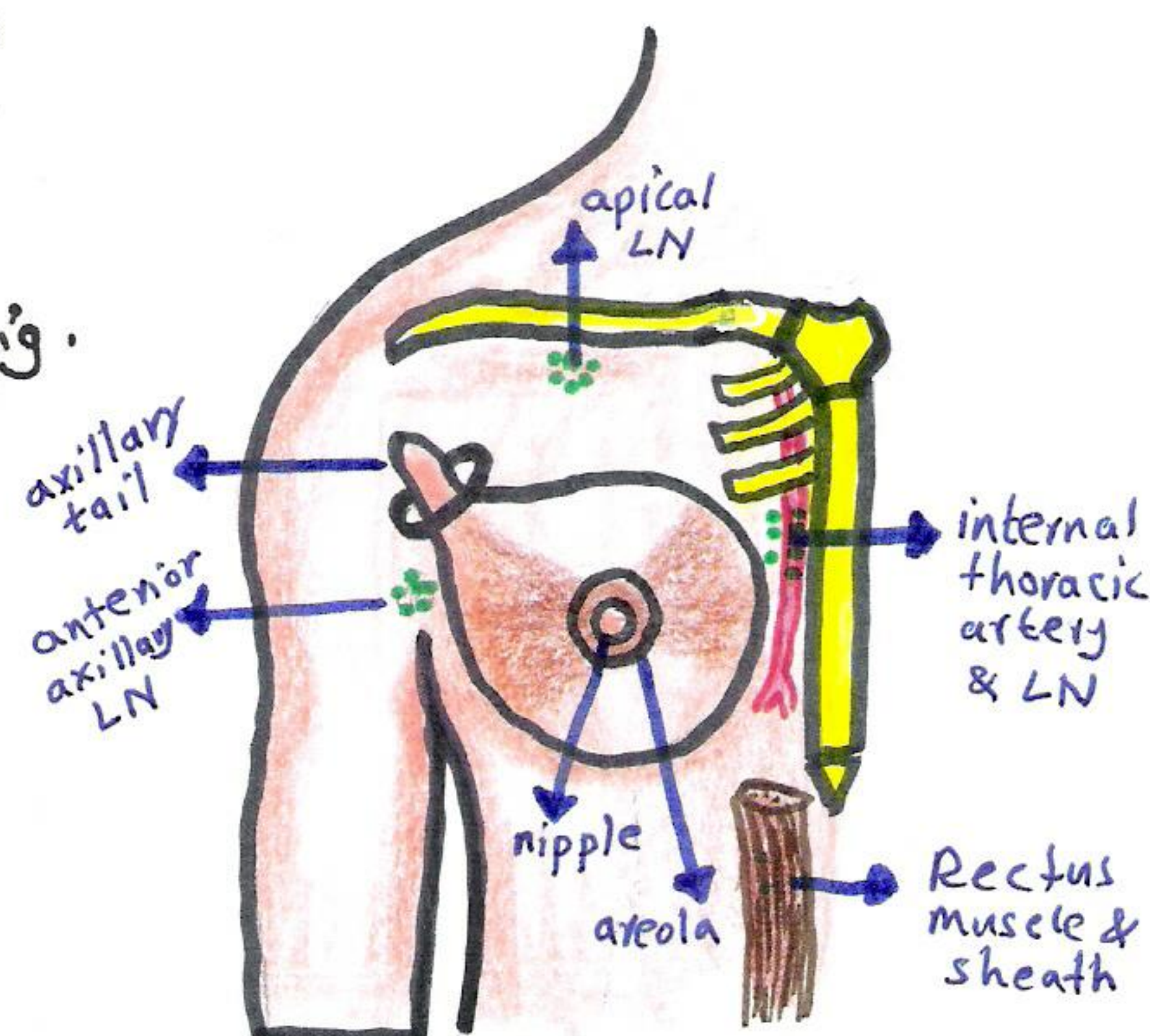
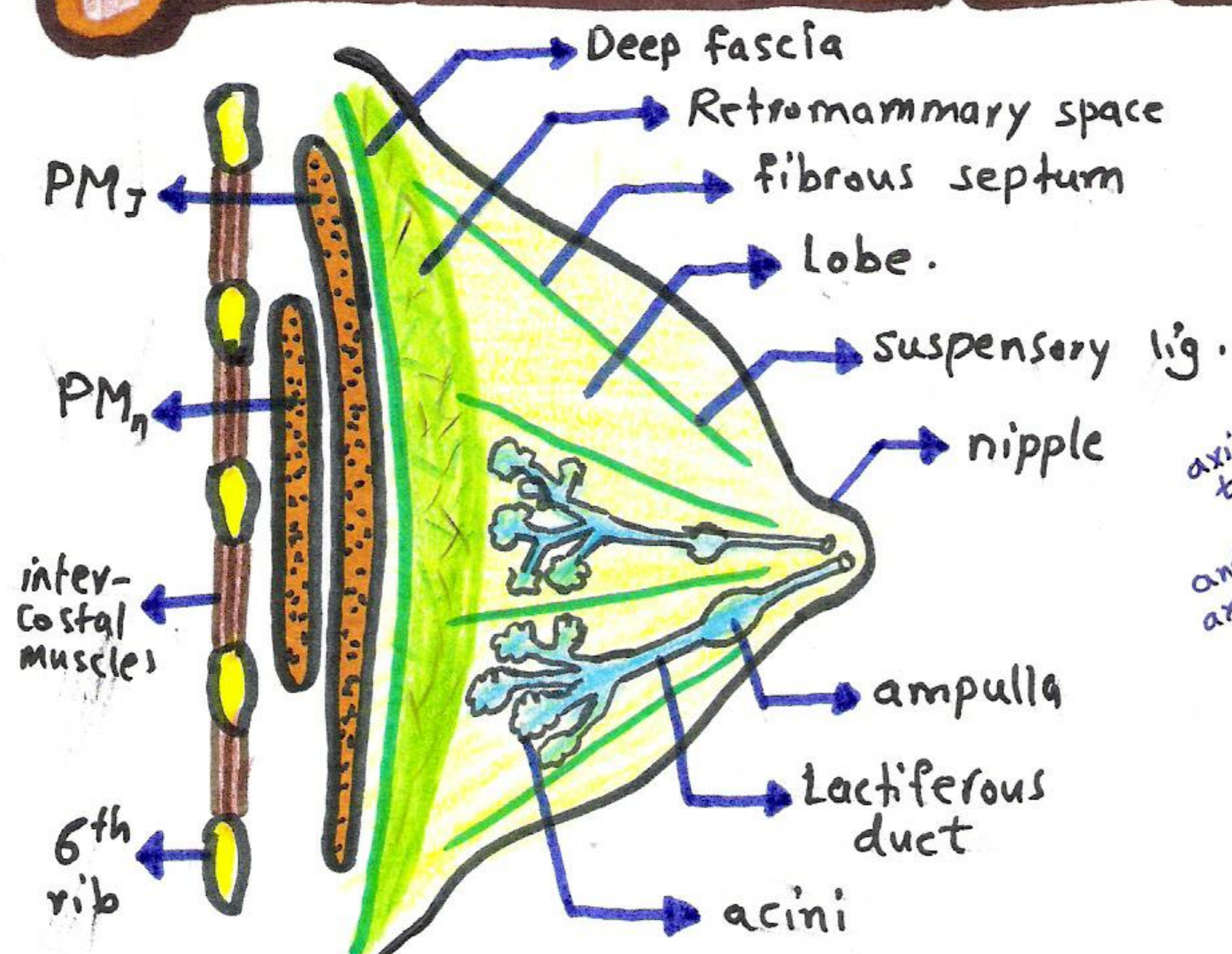
* Lymph drainage:-

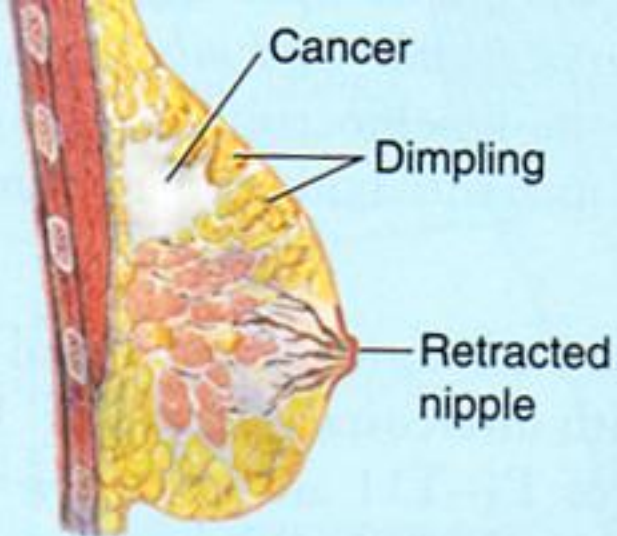
- Lateral quadrants: ^{& central part.} Drain into anterior (pectoral) group. (75%)
- Upper quadrants: Drain into apical group of lymph nodes.
- Lower quadrants: into Lymph plexus of rectus sheath & subphrenic ^{plexus}
- Medial quadrants: into internal thoracic (Parasternal) nodes ($\approx 25\%$)

some lymphatics of medial part across the front of sternum to anastomose with opposite breast (intermammary lymphatics).

* Clinical notes:-

- Male breast may enlarge in some disease $\Rightarrow$ "gynaecomastia".
- Suspensory (cooper's) ligament may be invaded by breast cancer causing dimpling of skin "Peau d' orange" by their shrinkage.
- Breast cancer may invade retromammary space into the muscle causing fixation of breast.
- Breasts at puberty assume their hemispherical shape under the influence of ovarian hormones & size $\uparrow$ by fat deposition.





Retracted signs



Edema of the skin
(Peau d'orange sign)



Nipple retraction
and deviation



Abnormal
contours

(A) Carcinoma of the breast

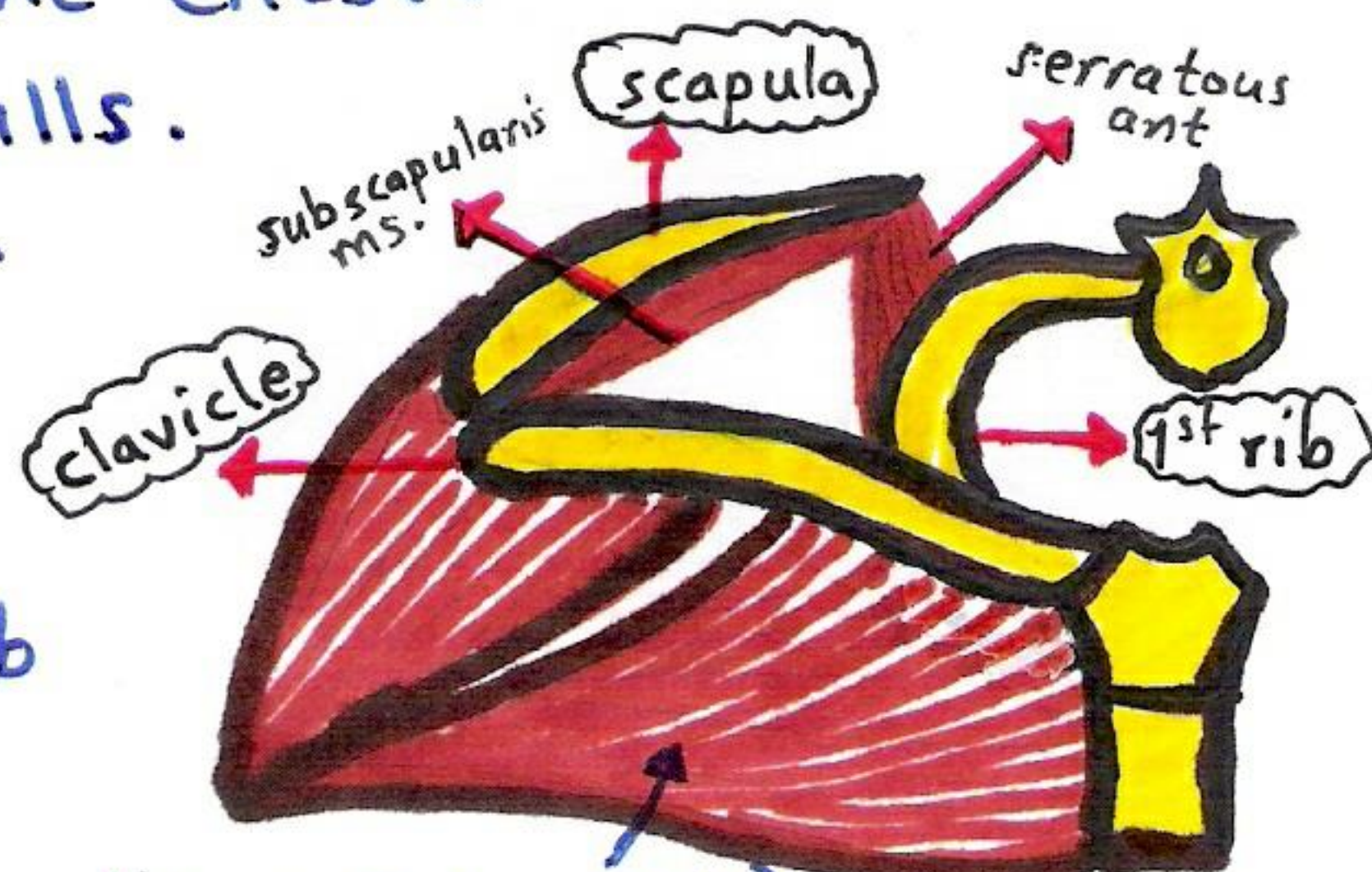
AXILLA

* DEFINITION :-

- Axilla (armpit) is a pyramidal space between upper part of arm & the side of the chest.
- It has an apex, base & 4 walls.

• APEX OF AXILLA :- "upper end".

- Front :- clavicle.
- Behind :- upper end of scapula.
- Medial :- Outer border of 1st rib



• BASE OF AXILLA :- "lower end"

- Front :- anterior axillary fold (pectoralis major = PM_J)
- Behind :- posterior axillary fold (Teres major & latissimus dorsi tendons)
- Medial :- Chest wall.

[NB] Base of axilla is formed by skin & fascia that connects the anterior & posterior axillary walls.

• WALLS OF AXILLA :- "4 walls"

• Anterior wall :-

- pectoralis major (PM_J), pectoralis minor (PM_n), subclavius & clavipectoral fascia.

• posterior wall :-

- Teres major (TM_J), Latissimus dorsi (LD) & subscapularis.

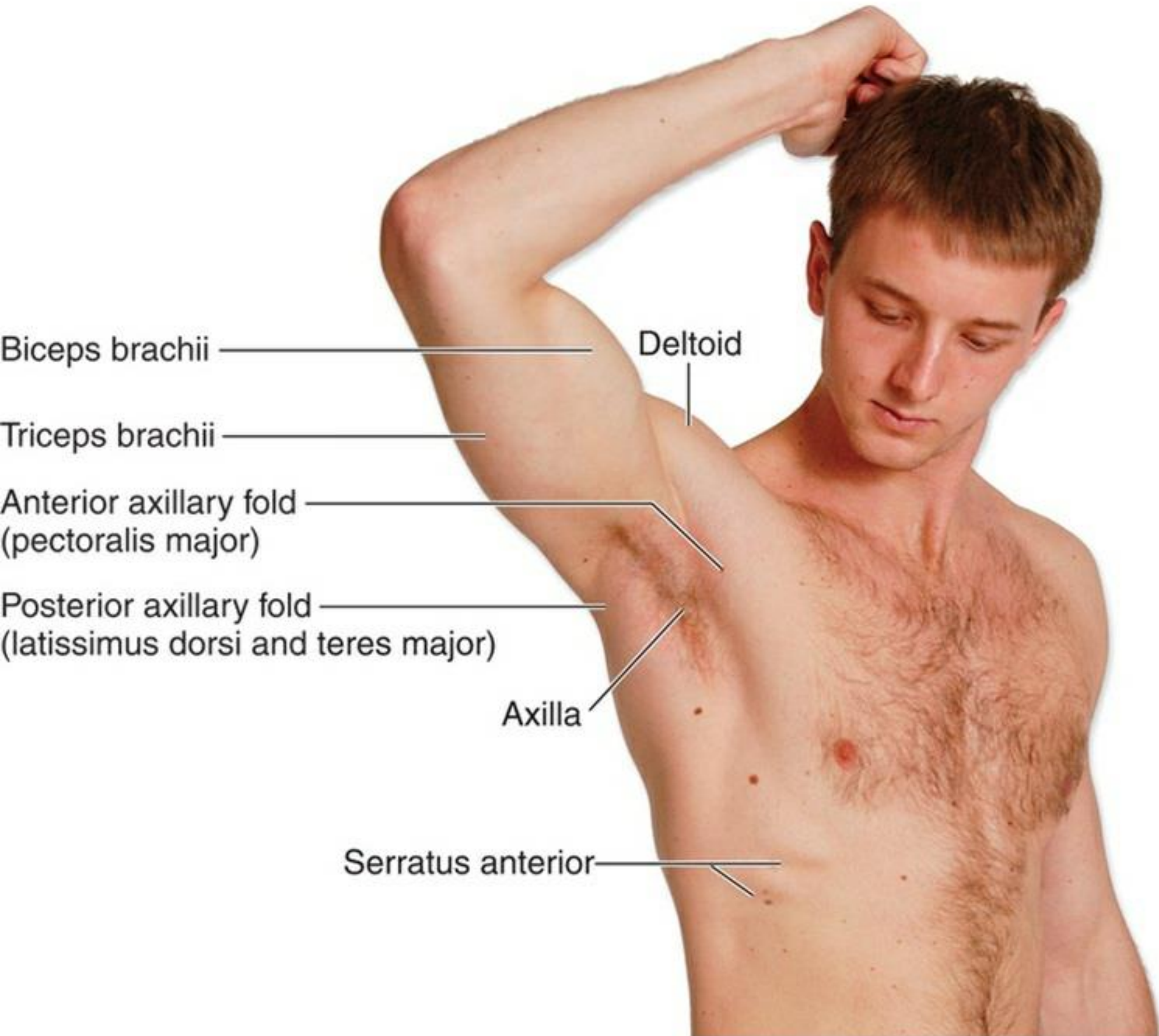
• Lateral wall :-

- Bicipital groove of humerus, Biceps brachii & coracobrachialis.

• Medial wall :-

- Upper 4-5 ribs, intercostal spaces & serratus anterior.

NB : apex of axilla called Cervicoaxillary canal



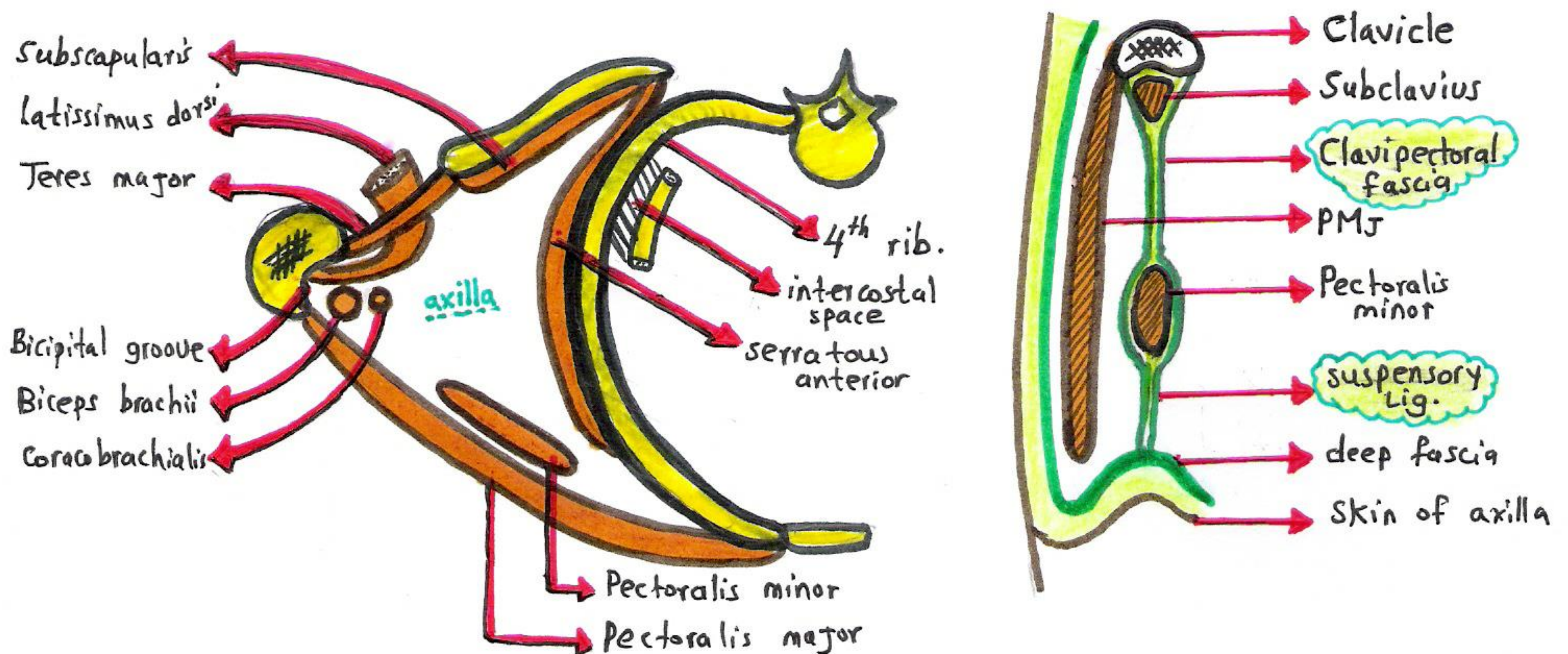
Anterolateral view

CONTENTS OF AXILLA

- 1- Brachial plexus (cords & branches).
- 2- Axillary artery (and its branches).
- 3- Axillary vein (and its tributaries).
- 4- Axillary lymph nodes (and L. vessels).
- 5- Axillary fat.
- 6- Axillary tail of breast.
- 7- Axillary sheath:

- axillary sheath is a continuation of prevertebral layer of deep fascia of neck.

- It contains :- ① axillary artery ② cords of brachial plexus.



Clavipectoral fascia :-

- Strong fibrous sheet between clavicle (above) "enclosing the subclavius muscle" and Pectoralis minor (below)
- It's lower part (after PMJ) forms suspensory lig. of axilla.
- It's upper border forms costo-coracoid lig. "between 1st rib & coracoid"
- It is pierced by
 - ① Lateral pectoral nerve (supplies PMJ)
 - ② Thoraco-acromial artery (from 2nd part axillary a)
 - ③ Cephalic vein (drains into axillary vein).
 - ④ Lymph vessels (drains into apical LN-).

*Delto-pectoral groove

- Groove between deltoid & pectoralis major.
- It contains: ① Deltoid branch of Thoracoacromial artery.
② uppermost part of cephalic vein.
③ Deltopectoral Lymph node

BRACHIAL PLEXUS

- It is a collection of nerves that lie partly in the axilla and partly in the neck.

• Roots of brachial plexus:-

- Ventral primary rami of C₅, 6, 7, 8 and T₁ nerves.

• Trunks of br. plexus:-

- Upper trunk (union of C₅ & C₆ roots).
- Middle trunk (continuation of C₇ root).
- Lower trunk (union of C₈ & T₁ roots).

• Divisions of br. plexus:-

- Each trunk divides (behind clavicle) into anterior & post. divisions

• Cords of br. plexus:-

- Lateral cord:- union of anterior divisions of upper & middle trunks (C₅, 6).
- Medial cord:- anterior division of lower trunk (C₇).
- Posterior cord:- union of posterior divisions of the 3 trunks (C₅ → T₁).

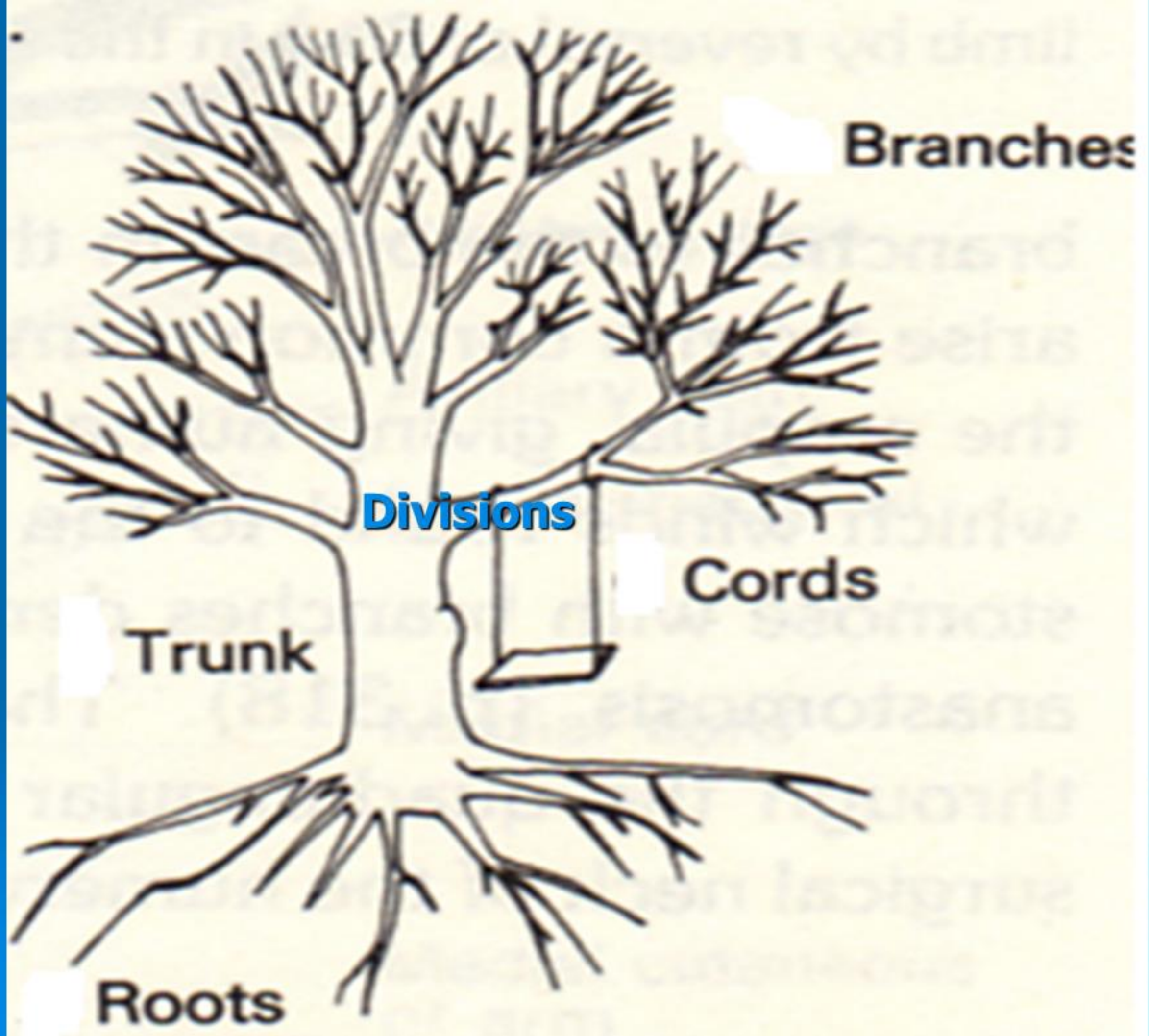
• Branches of br. plexus:-

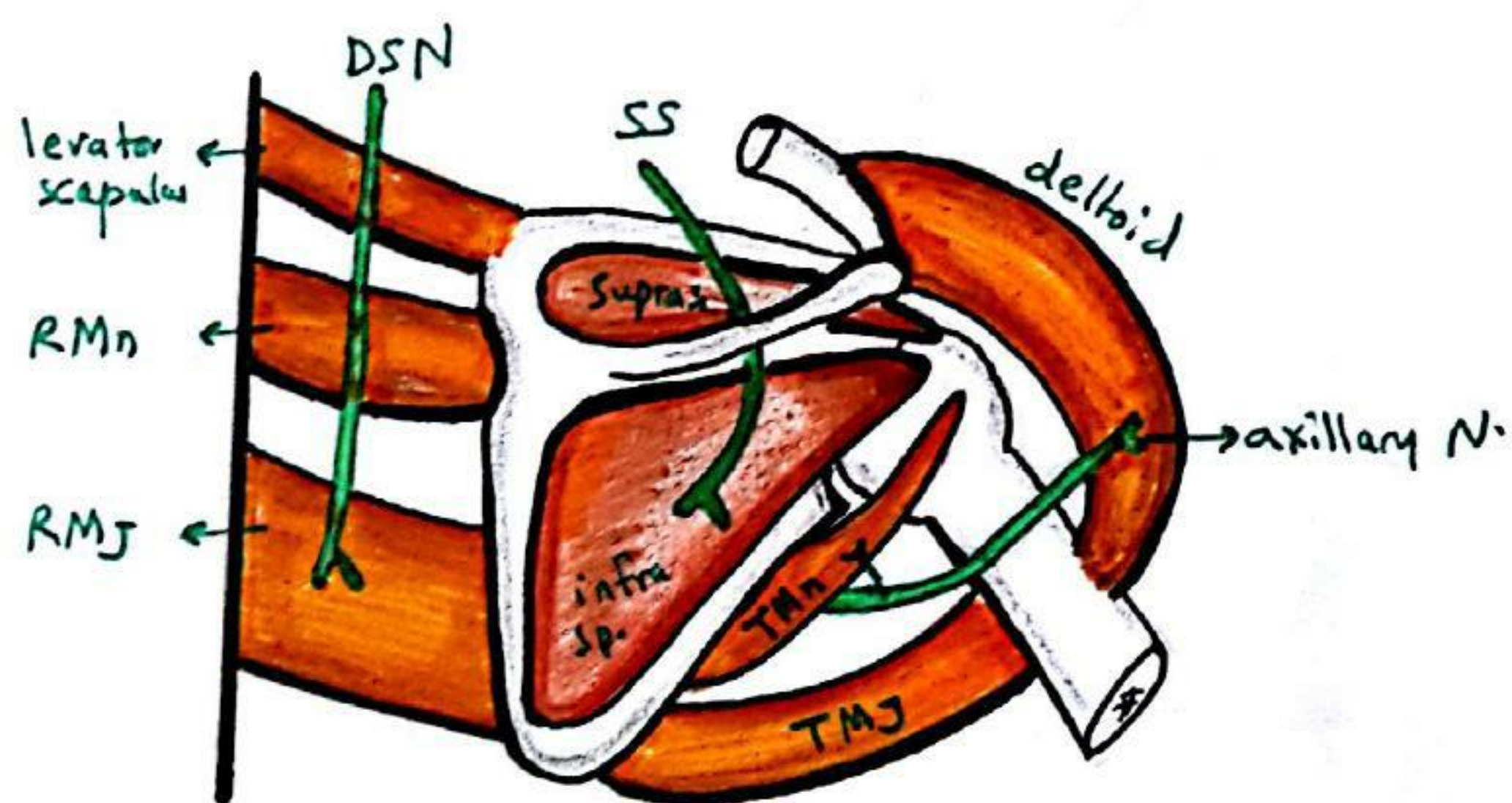
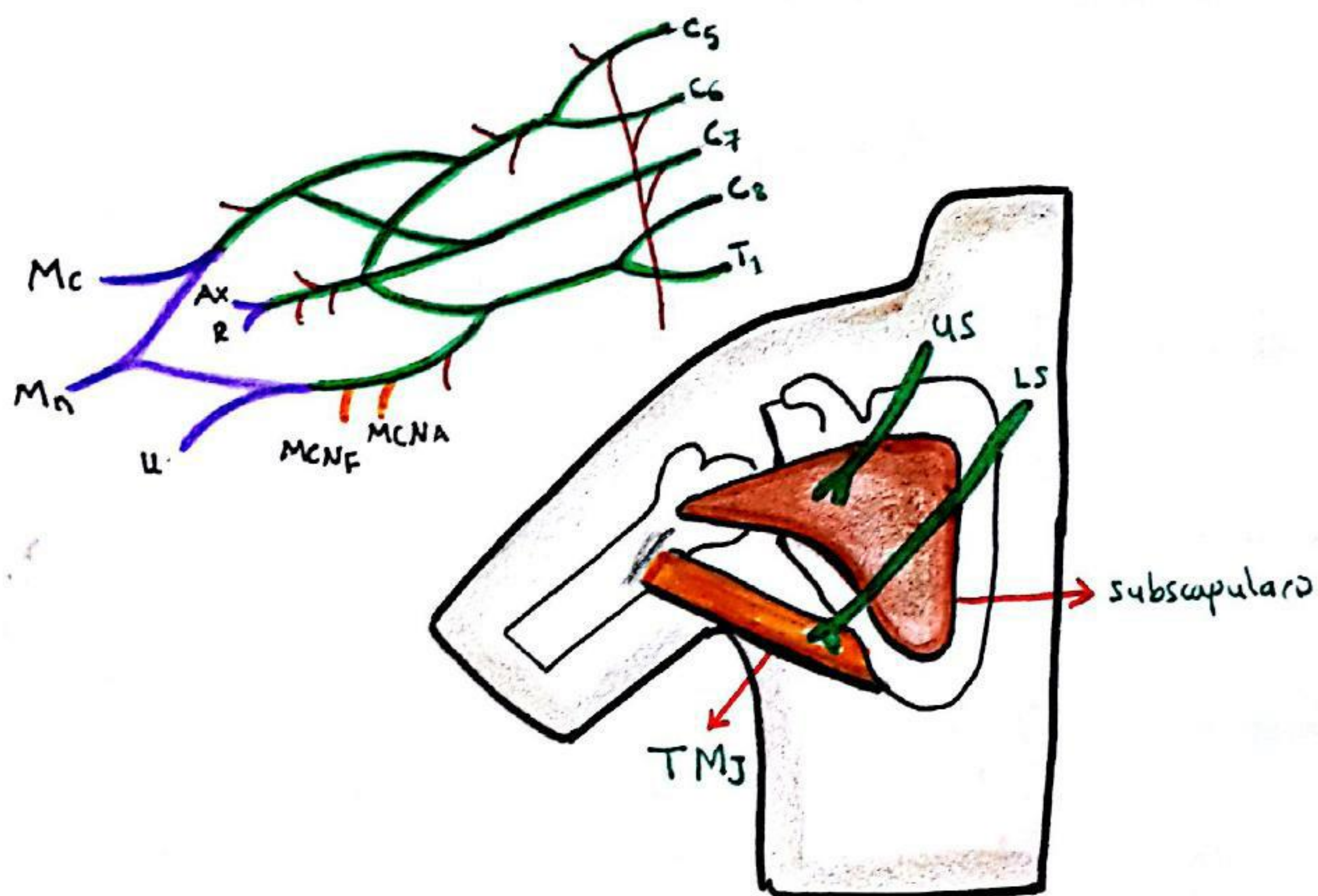
- Root: ① Dorsal scapular N. (C₅) , ② Long thoracic N. (C₅, 6, 7)
③ branch to phrenic (C₅) ④ Twigs to scalenus & longus coli muscles.
- Upper trunk: ① Supra scapular (C₅, 6) ② N. to subclavius (C₅, 6).
- Lat. cord :- ① Lat. pectoral N. (C₅, 6, 7) ② Lat. root of Median N. (C₅, 6, 7).
③ Musculocutaneous (C₅, 6, 7)
- Medial cord: ① Med. pectoral N. (C₈, T₁) ② Med. root of Median N. (C₈, T₁)
③ Ulnar N. (C₇, 8, T₁). ④ Med. cutaneous N. of arm (C₈, T₁)
⑤ Medial cut. N. of forearm (C₈, T₁).
- Post. cord: ① Radial N. (C₅, 6, 7, 8, T₁) ② axillary N. (C₅, 6)
③ upper subscapular C₅, 6. ④ lower subscapular (C₅, 6)
⑤ Thoraco dorsal C₆, 7, 8

ROOT



16 | upper





SKIN OF UPPER LIMB

*Cutaneous nerve supply :- page 9

① Supraclavicular nerve (C₃.C₄):-

- Branch of Cervical plexus.
- Supplies skin over the upper 1/2 of deltoid (shoulder region).

② upper Lat. cutaneous N. of arm (C₅.C₆)

- Branch of axillary nerve.
- Supplies skin over the lower 1/2 of deltoid. (shoulder region).

③ Lower lateral cut. N. of arm (C₅.C₆)

- Branch of radial nerve.
- Supplies skin of lateral side of arm (below deltoid).

④ Intercosto-brachial nerve (T₂)

- It is the lateral branch of second intercostal nerve.
- Supplies skin of upper part of medial side of arm (close to axilla).

⑤ Medial cut. N. of arm (C₈-T₁)

- Branch of medial cord of brachial plexus.
- Supplies skin of medial side of arm (below axilla).

⑥ Posterior cut. N. of arm (C₅→T₁)

- Branch of radial nerve.
- Supplies skin of back of arm (from deltoid tuberosity to elbow).

⑦ Posterior cut. N. of forearm (C₅.6.7.8)

- Branch of radial nerve
- Supplies skin of back of forearm (from elbow to wrist)

⑧ Medial cut. N. of forearm (C₈-T₁)

- Branch of medial cord of brachial plexus.
- Supplies skin of medial side of forearm (it divides into ant & post br.)

⑨ Lateral cut N. of forearm (C₅.6)

- Continuation of musculo-cutaneous nerve. → and skin over base of thenar eminence.
- Supplies skin of lateral side of forearm (divides into ant. & post br.)

(10) Palmar cut. branch of ulnar N. (C8.T1):-

-supplies skin of medial $\frac{1}{3}$ of the palm.

(11) Palmar cut br. of median N. (C6.7.8):-

-supplies skin of lateral $\frac{2}{3}$ of the palm.

(12) Dorsal cut. br. of ulnar N. (C8.T1):-

-supplies skin of medial $\frac{1}{3}$ of back of hand.

(13) Superficial br. of radial N. (C6.7.8):-

-supplies skin of lateral $\frac{2}{3}$ of back of hand.

(14) Palmar digital br. of ulnar N. (C8.T1):-

-supplies skin of palmar side of medial $1\frac{1}{2}$ fingers, also the skin over back of distal & middle ^{phalanges} of Medial $1\frac{1}{2}$ fingers

(15) Dorsal digital br. of ulnar N. (C8.T1):-

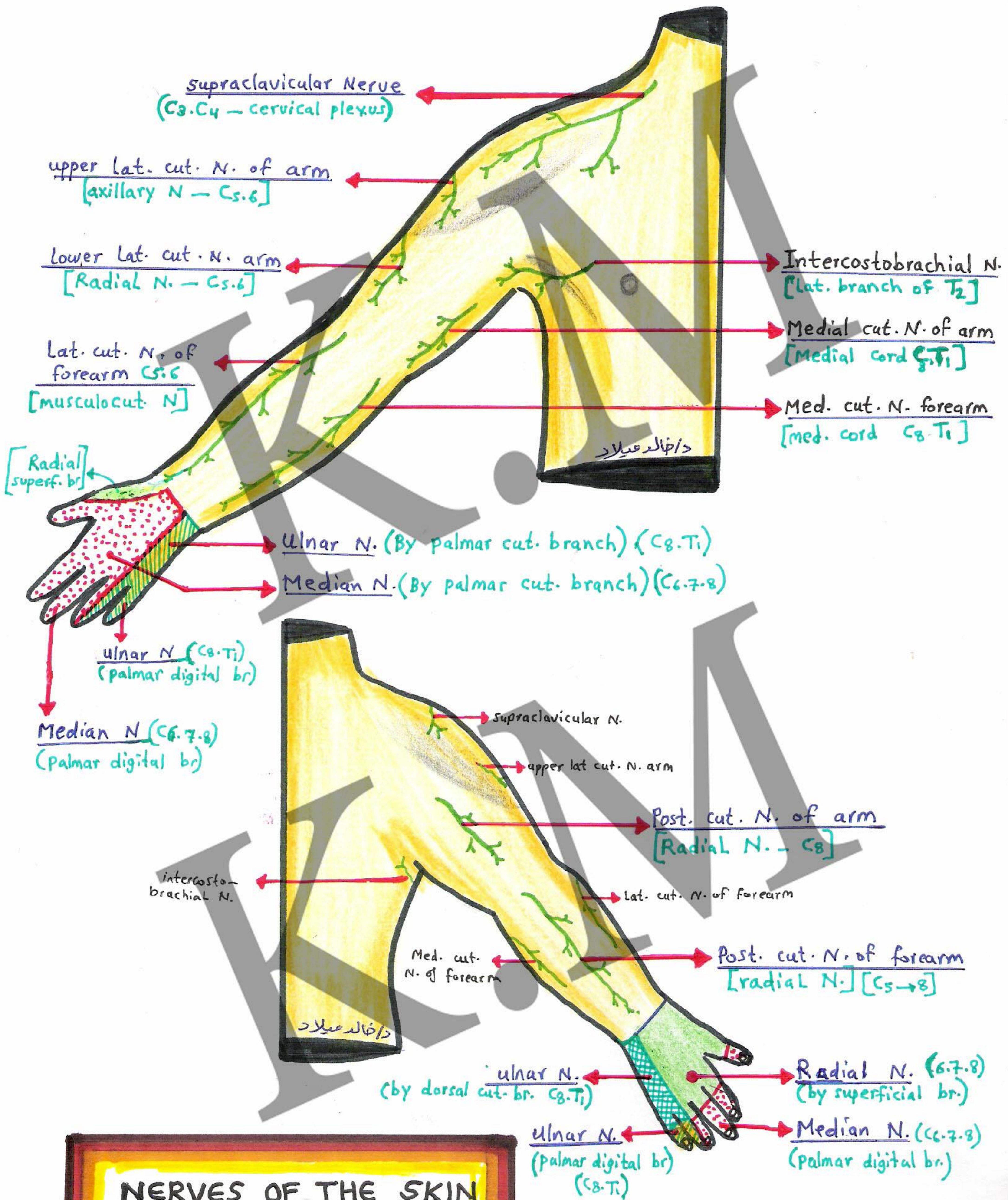
-supplies skin over back of proximal phalanx of medial $1\frac{1}{2}$ fingers

(16) palmar digital br. of median N. (C6.7.8):-

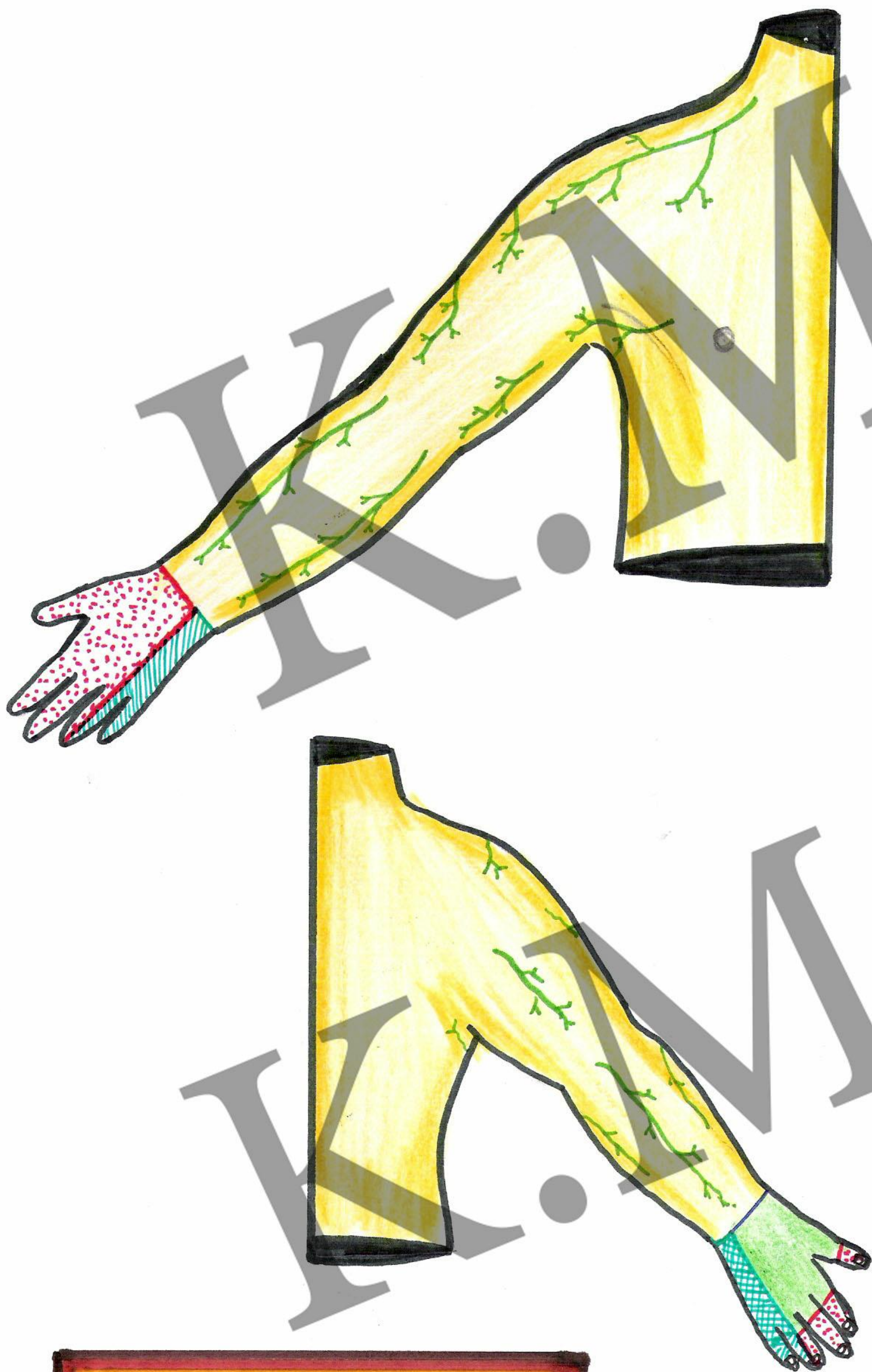
-supplies skin over palmar side of lateral $3\frac{1}{2}$ fingers, also the skin over back of distal & middle phalanges of lateral $3\frac{1}{2}$ fingers [distal phalanx only in thumb]

(17) Dorsal digital br. of radial N. (C6.7.8):-

-supplies skin over back of proximal phalanx of lateral $3\frac{1}{2}$ fingers.



NERVES OF THE SKIN
"UPPER LIMB"...



NERVES OF THE SKIN
"UPPER LIMB"...

SUPERFICIAL FASCIA OF UPPER LIMB

- Superficial fascia of upper limb contains the superficial veins and lymphatics.

VEINS OF UPPER LIMB

Page 13

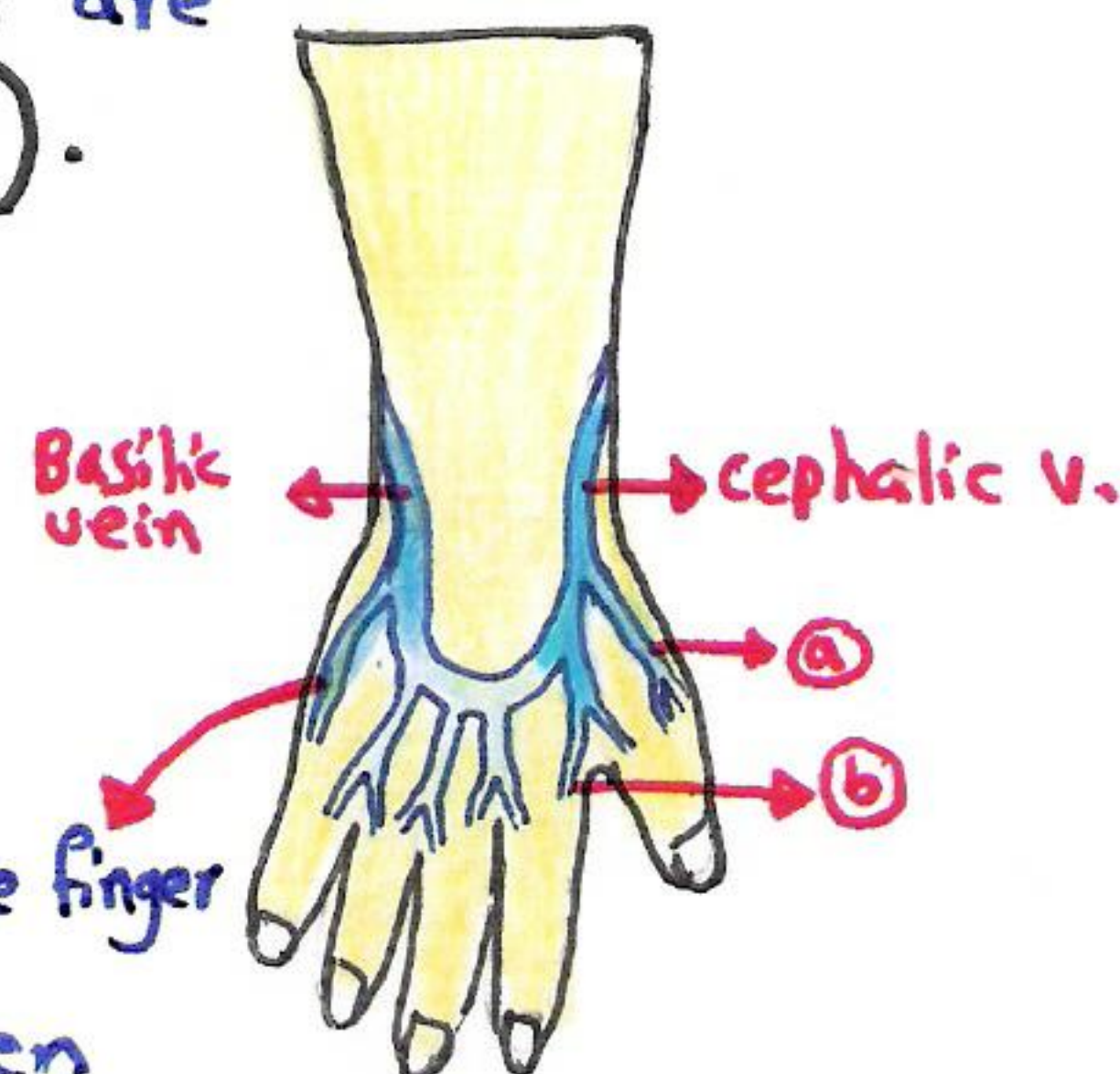
(I) Superficial veins :-

* Dorsal venous arch :-

- It lies in superficial fascia of dorsum of hand. (distally).
- It receives 3 dorsal metacarpal veins (which are formed by union of dorsal digital veins).
- It gives ① Basilic vein medially and ② Cephalic vein laterally.

* Basilic vein :-

- Formed by union of medial end of dorsal venous arch + medial dorsal digital vein of little finger
- Ascends along medial side of forearm then the medial side of arm. where it pierces deep fascia at the middle of arm.



- and ends at lower border of Teres major as it continues as axillary vein.

* Cephalic vein :-

- Formed by union of lateral end of dorsal venous arch + dorsal digital veins of thumb^(a) + lateral dorsal digital vein of index^{(b)†}
- Ascends along lateral side of forearm & arm, entering into deltopectoral groove, Piercing the clavipectoral fascia.
- Ends by draining into axillary vein

[NB] At cubital fossa Basilic & cephalic veins are joined by Median Cubital vein.

(II) - DEEP VEINS :

* Axillary vein :-

- It lies under deep fascia "in axilla".
- Begins as a continuation of basilic vein at lower border of Teres major.
- Ends by becoming subclavian vein at lateral (outer) border of first rib.
- Relation, lateral $\longrightarrow$ axillary artery.
 - Medial $\longrightarrow$ apical & lateral axillary lymph nodes.
- Tributaries of axillary vein corresponds to the 6 branches of axillary artery + cephalic v. + basilic v + two venae comitantes.

LYMPH OF UPPER LIMB

Page (13)

• Lymph nodes of upper limb are :-

1. Supratrochlear (epitrochlear) LN.
2. Infraclavicular group of LN.
3. axillary groups of LN (5 groups).

① Supratrochlear LN :- (epitrochlear) :-

- They present in front of trochlea of humerus.
- Receives afferent from medial side of hand & arm (along basilic v)
- Sends efferent to lateral axillary LN.

② Infraclavicular LN :- (delto-pectoral) :-

- Present under clavicle (in deltopectoral groove).
- Receives afferent from lateral side of hand, forearm & arm.
- Sends efferent to apical group.

③ Axillary groups of LN :-

• Lateral group :-

- Present in axilla (in lateral wall) along axillary vein (medial side)
- Receives afferent from medial side of upper limb (through supratrochlear)
- Sends efferent to Central and apical groups.

• Anterior (Pectoral) group:-

- Present along lower border of pectoralis minor (along lat thoracic vessels)
- Receives afferent from front of trunk above umbilicus and lat. quadrant of breast.
- Sends efferent to central and apical LN.

• Posterior (subscapular) group:-

- Present in Post. wall of axilla along subscapular vessels.
- Receives afferent from back of trunk above iliac crest.
- Sends efferent to central and apical LN.

• Central group:-

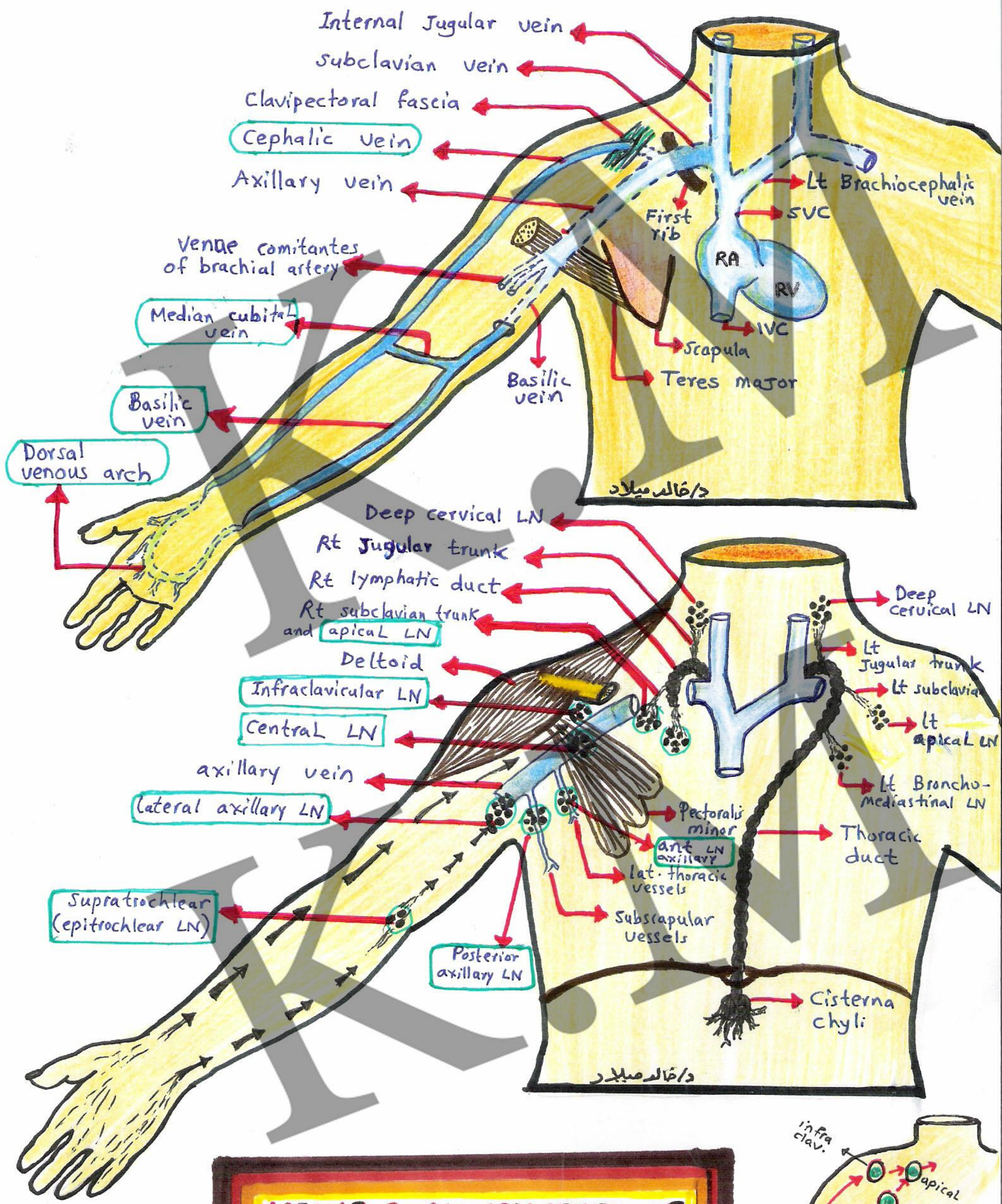
- Present embedded in fat of axilla near its base
- Receives afferent from anterior, posterior & lateral groups
- Sends efferent to apical LN.

• Apical group:-

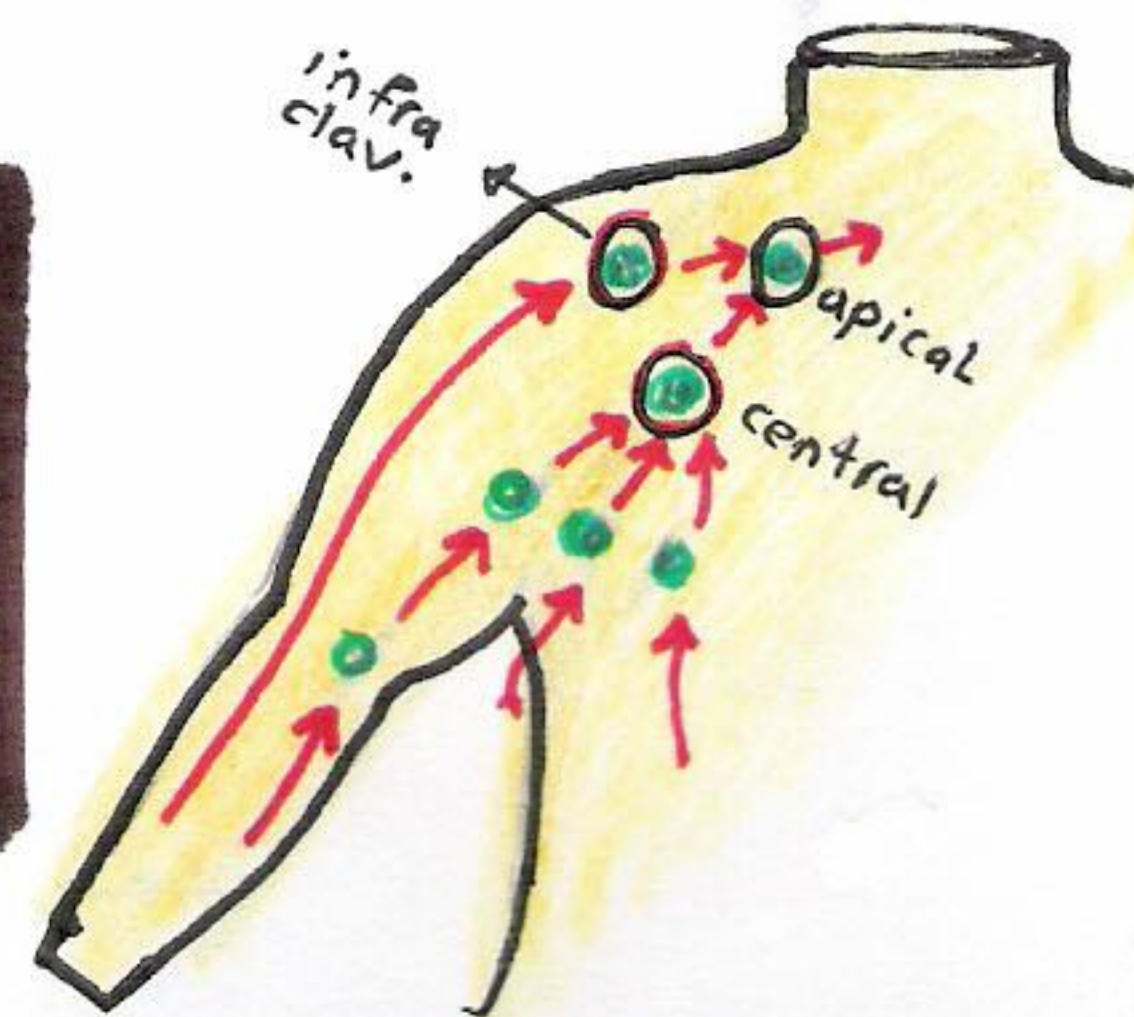
- Present in apex of axilla, medial to axillary vein. (under clavicle)
- Receives afferent from all other groups and upper quadrant of breast.
- Sends efferent by subclavian trunk to Thoracic duct in the left side or Rt lymphatic duct in the right side.
- It also sends to deep cervical LN.

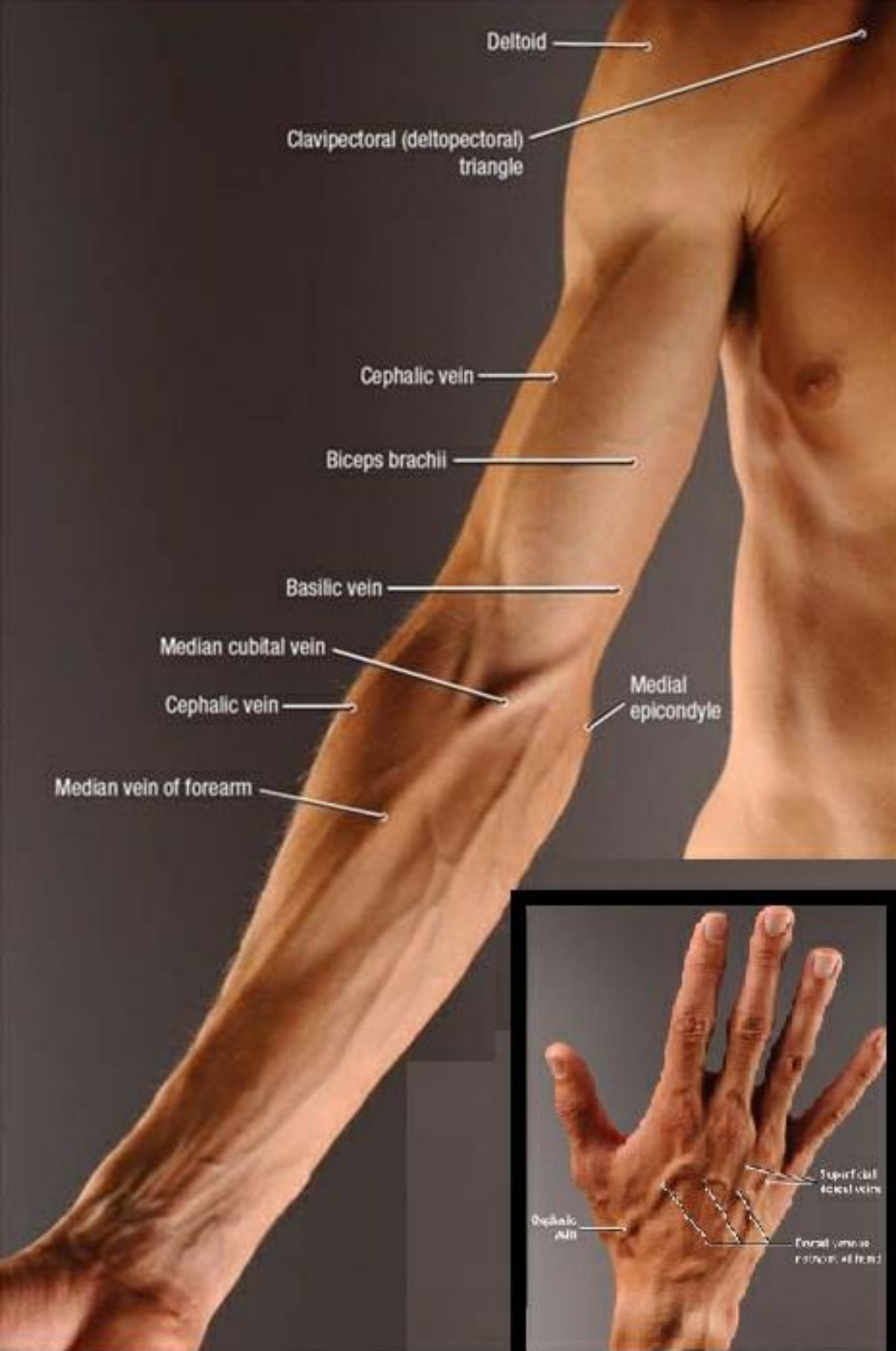
NB: Lymph nodes of upper limb can be divided into-

- ① Deep group:- axillary nodes.
- ② Superficial nodes:- infraclavicular & supraclavicular.



VEINS & LYMPHATICS OF THE UPPER LIMB





DEEP FASCIA OF UPPER LIMB

*ARM:

- The arm is surrounded by a sheath of deep fascia.
- It sends two intermuscular septa (medial & lateral) to divide the arm into two compartments (anterior & posterior).
- Medial inter-muscular septum is attached to medial supracondylar ridge of humerus.
 - Perforated by ulnar nerve, superior ulnar collateral artery and post. branch of inf. ulnar collateral &
 - Perforated by radial nerve & profunda brachii artery
- Lateral intermuscular septum to lateral supracondylar ridge.

• Anterior compartment contains:

- Muscles: - BBC (Biceps brachii, Brachialis & coracobrachialis)
- Vessels: - Brachial artery & basilic vein.
- Nerves: - musculocutaneous N. + others (ulnar, Median & radial N.)

• Posterior compartment contains:

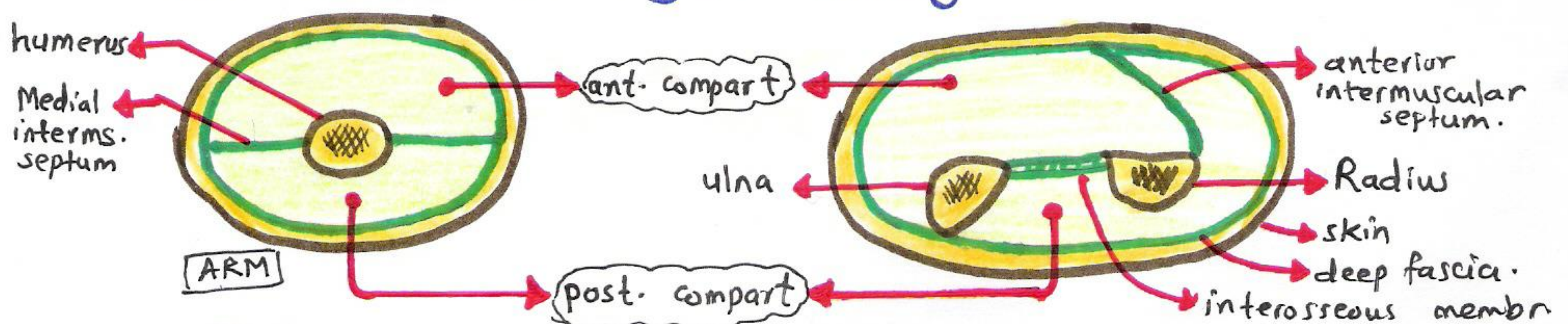
- Muscles: - Triceps.
- Vessels: - Profunda brachii artery.
- Nerves: - radial nerve + others passing (ulnar in lower $\frac{1}{2}$)

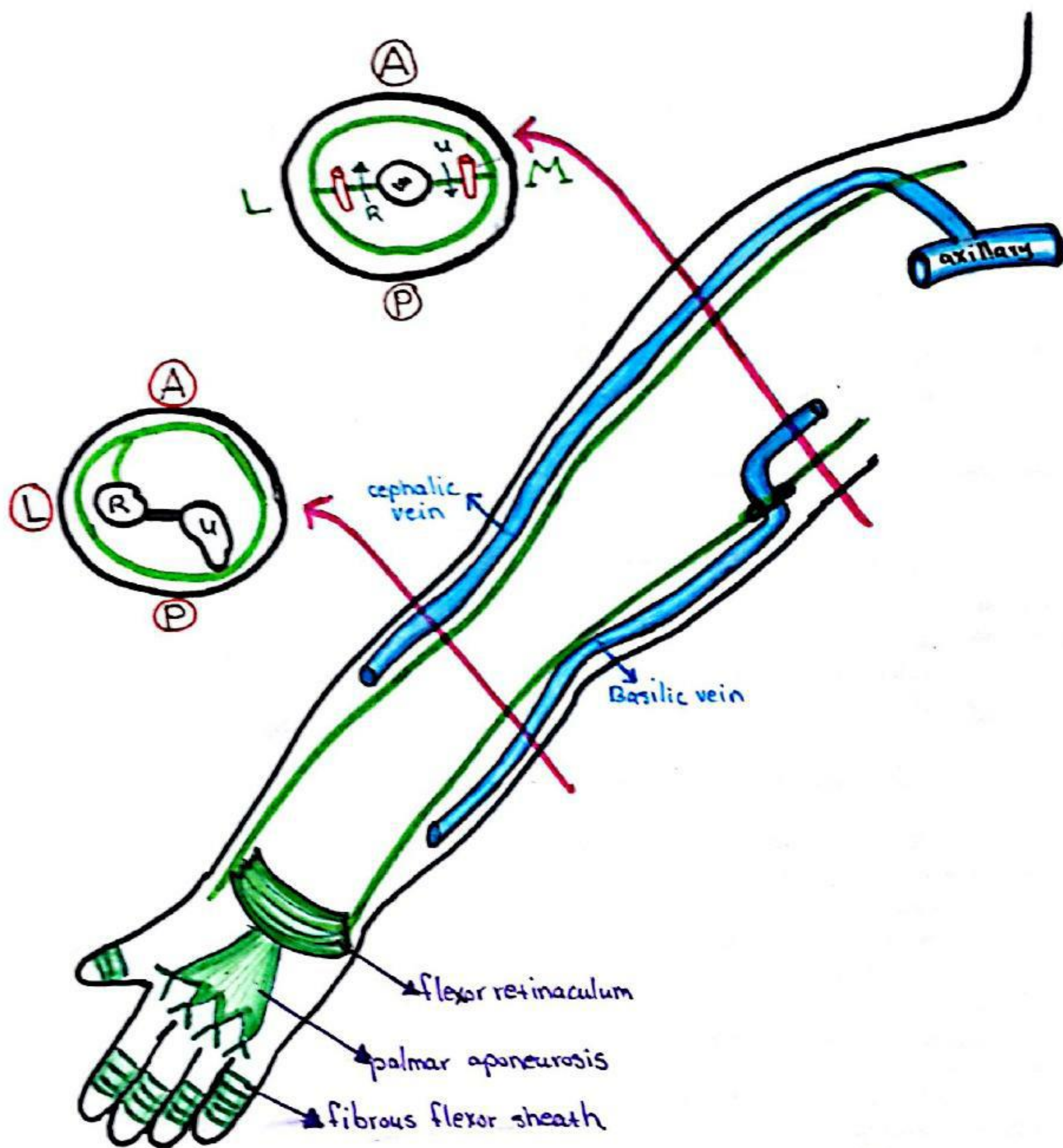
*FOREARM:-

- The interosseous membrane together with an anterior intermuscular septum divides the forearm into 2 compartments (anterior & posterior) with incomplete lateral compartment.

*HAND:-

- Deep fascia thickened in front & back of wrist to form Flexor & extensor retinacula respectively.
- Also thickened in the palm forming Palmar aponeurosis and in front of fingers forming fibrous flexor sheath.





ARTERIES OF UPPER LIMB

AXILLARY ARTERY

* Beginning:

- Begins at lateral (outer) border of 1st rib as continuation of subclavian artery.

* End:

- At lower border of Teres major becoming brachial artery.

NB: axillary artery is divided into 3 parts by pectoralis minor where is the 2nd part deep to muscle, 1st part above it and the 3rd part below it.

* Branches:-

- 1st part gives:- superior (highest) thoracic artery.
- 2nd part gives:- Lateral thoracic a.
 - Thoracoacromial a. which gives
 - acromial branch.
 - pectoral.
 - clavicular.
 - Deltoid.
- 3rd part gives:- Subscapular a.
 - Anterior circumflex humeral a.
 - Posterior circumflex humeral a.

- NB**
- ① superior thoracic a: supplies part of front of trunk.
 - ② Lateral thoracic a - gives lateral mammary branch to breast
- anastomose with superficial epigastric a
 - ③ Thoracoacromial a - gives
 - 1 - acromial branch: toward acromion
 - 2 - pectoral: between 2 pectoral muscles
 - 3 - clavicular: toward sternoclavicular joint
 - 4 - Deltoid: supplies deltoid & PMJ.
 - ④ Subscapular a :- gives circumflex scapular to infraspinous fossa.
- continuous as thoracodorsal a to latissimus dorsi
 - ⑤ Anterior circumflex humeral :- in front of surgical neck of humerus
- gives ascending br. to shoulder joint
 - ⑥ Posterior circumflex humeral :- behind surgical neck of humerus
- gives descending branch.

NB: surface anatomy:- with arm abducted 90° the artery represented by line between Midclavicular point to medial side of middle of the arm where pulsation can be felt.

*Relation of axillary artery :- see page 20

	First part	Second part	Third part
Anterior	- Pectoralis major (PMJ) & covering skin & fascia.	- PMJ - PMn (minor)	- PMJ. - Medial root of Median N.
Posterior	- Long thoracic N. - Medial cord.	- Posterior cord. - subscapularis, shoulder	- radial & axillary nerve - subscapularis, LD, TMJ
Medial	- Axillary vein	- Axillary vein - Medial cord	- Axillary vein - ulnar N., MCN of arm
Lateral	- cords of br. plexus (Post. & Lat. cords) all cords	- Lateral cord - coracobrachialis	- Musculocutaneous & Lat. root of Median nerves - coracobr., biceps. humerus

BRACHIAL ARTERY

*Beginning :-

- At lower border of Teres major as continuation of axillary a.

*END:

- At level of neck of radius (1cm below elbow) by dividing into 2 terminal branches (ulnar & radial arteries).

*Branches:

1. Profunda brachii a.
2. Nutrient a (to humerus).
3. Muscular branches (to arm muscles).
4. Superior ulnar collateral a.
5. Inferior ulnar collateral a.
6. Ulnar a (larger terminal branch).
7. Radial a (smaller terminal branch).

NB - Brachial artery is accompanied by two venae comitantes
- It is medial to humerus but in lower part in front of it

*Relation of brachial a :- (see page 21)

• Superficial (ant) :-

- only skin & fascia, crossed below by bicipital aponeurosis which separates it from median cubital vein. [crossed in middle by Median N.]

• Deep (post) :-

- Triceps (Long & medial heads) and brachialis.

• Lateral :-

- Above :- coracobrachialis & median nerve
- below :- Biceps brachii.

• Medial :-

- above :- ulnar nerve & MCN ^{& basilic vein} forearm (medial cut. N. of forearm).
- below :- Median nerve.

Notes :-

- Profunda brachii a :- is the highest & deepest branch, arising from posteromedial ^{aspect.} of humerus.
 - accompanied by radial Nerve in spiral groove of humerus.
 - Divides into ① ascending br. → anastomosis around surgical neck
 - ② Descending br. → divides into ant. & post. to anastomose around Lat. epicondyle.
- Nutrient a :- enters humerus at insertion of coracobrachialis.
- Superior ulnar collateral a :- accompanied by ulnar N. behind Medial epicondyle
- Inferior ulnar collateral a :- arise 5 cm above elbow, divided into anterior branch (in front of med. epicondyle) and post br (behind it).

ARTERIAL ANASTOMOSIS

*ANASTOMOSIS AROUND SCAPULA : see page 19

- 1- Sub scapular a & circumflex scapular a (axillary a - 3rd part).
- 2- Suprascapular a (subclavian a - 1st part - by thyrocervical trunk).
- 3- Deep branch of transverse cervical (thyrocervical trunk).
- 4- Lateral & dorsal branches of posterior intercostal arteries (aorta)

*ANASTOMOSIS AROUND SURGICAL NECK OF HUMERUS :-

- 1- Anterior circumflex humeral (axillary).
- 2- Posterior " " " "
- 3- Ascending branch of profunda brachii (brachial).

* ANASTOMOSIS AROUND SHOULDER: see page 20

1. Suprascapular artery $\longrightarrow$ (thyrocervical trunk - subclavian a).
2. Acromial & deltoid branches of thoracoacromial a $\longrightarrow$ (axillary a).
3. Ascending branch of anterior circumflex humeral a $\longrightarrow$ (axillary a).

* ANASTOMOSIS AROUND ELBOW :-

• In front of medial epicondyle:-

- Anterior branch of inferior ulnar collateral a (brachial)
- Anterior ulnar recurrent (ulnar a).

• Behind the medial epicondyle:-

- Superior ulnar collateral a & Post. br. of inf. ulnar collateral a
- Posterior ulnar recurrent (ulnar a).

• In front of Lateral epicondyle:-

- Anterior descending branch of Profunda brachii (brachial a)
- Radial recurrent a (ulnar a).

• Behind the Lateral epicondyle:-

- Posterior descending br. of Profunda brachii (brachial a)
- Interosseous recurrent a (ulnar a).

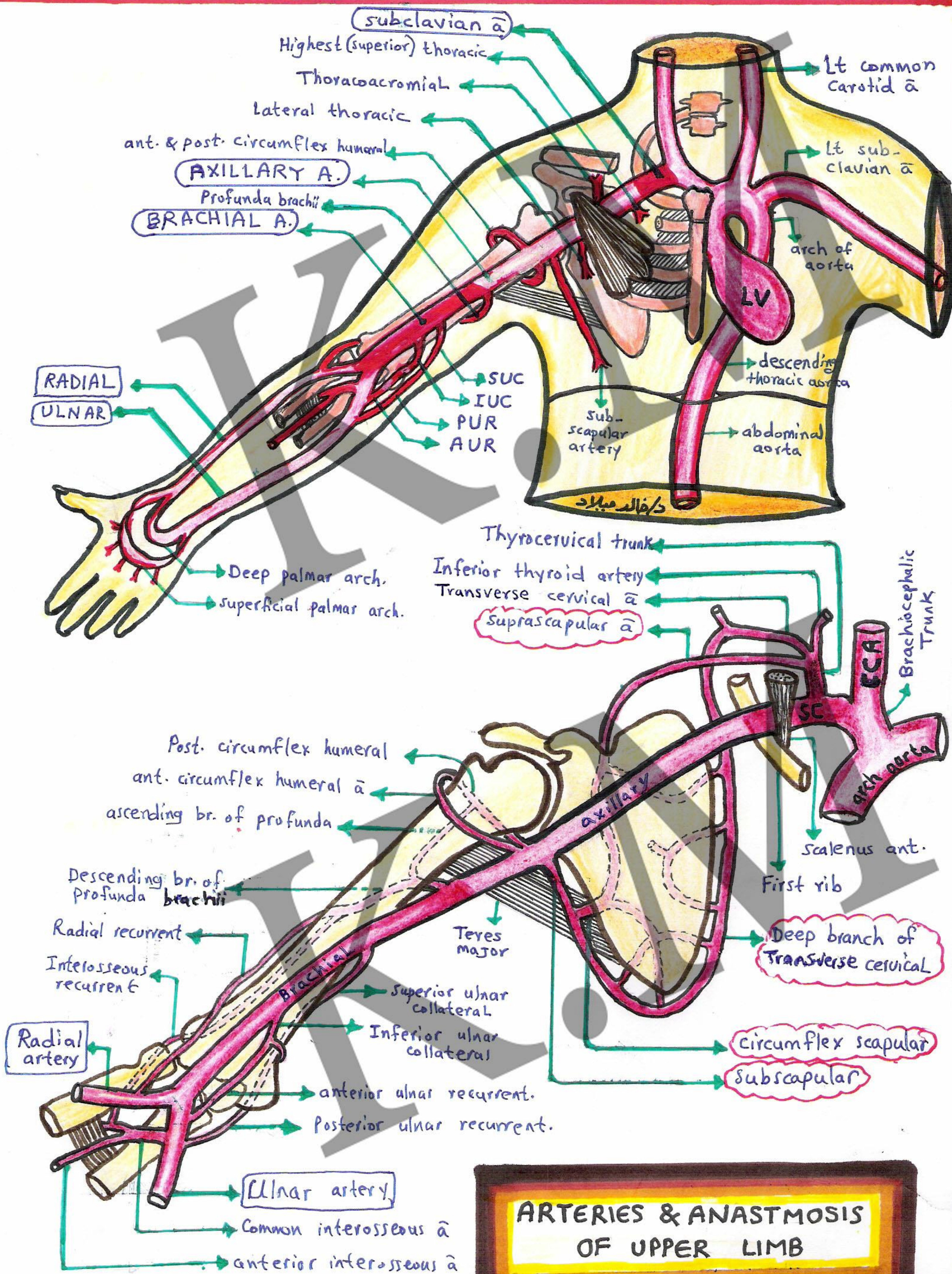
* ARTERIES & ANASTOMOSIS IN FOREARM AND THE HAND $\rightsquigarrow$ Discussed later.

NB:- deep branch of transverse cervical also named dorsal scapular artery [accompanied by dorsal scapular nerve] at medial border of scapula $\rightarrow$ deep to muscles

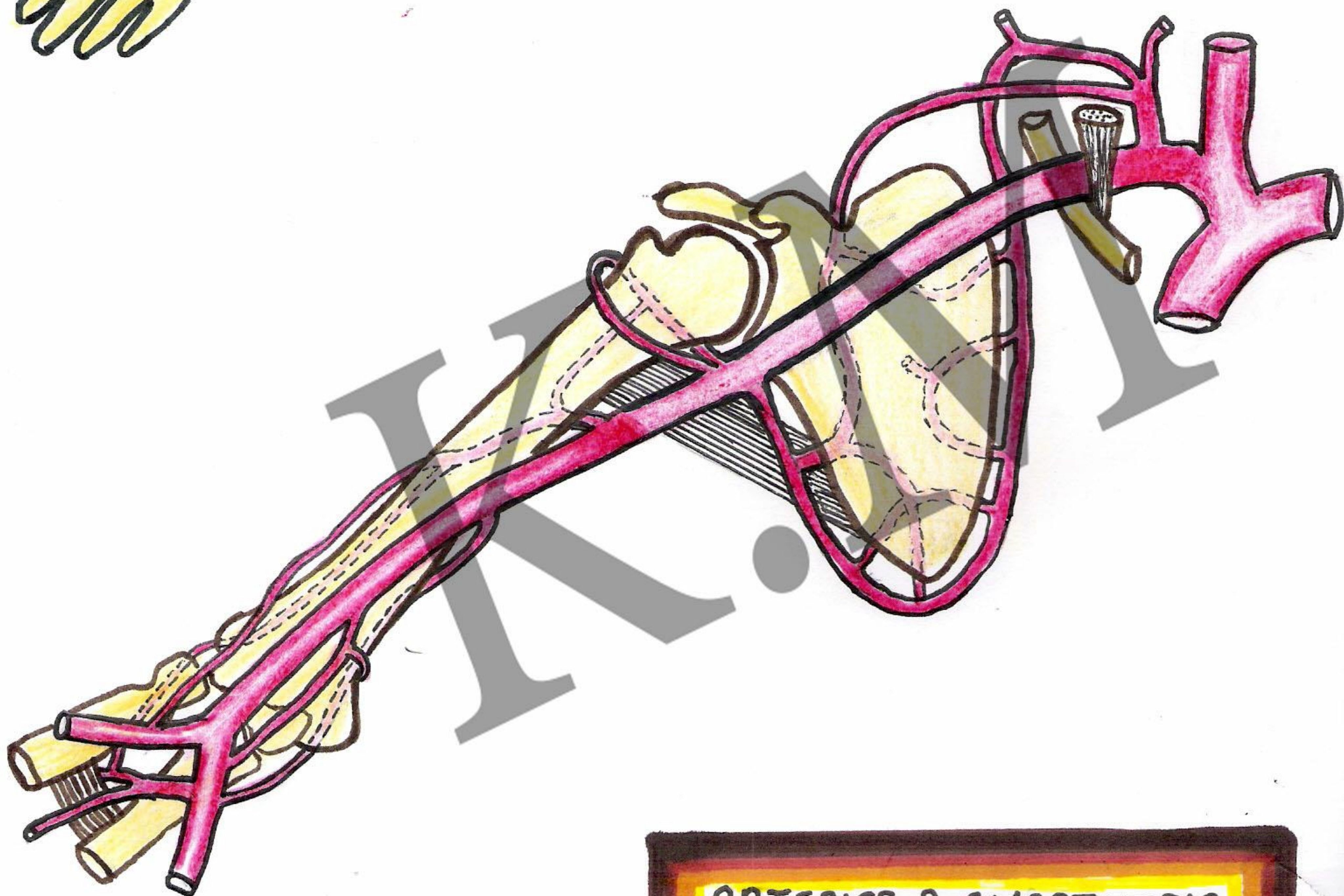
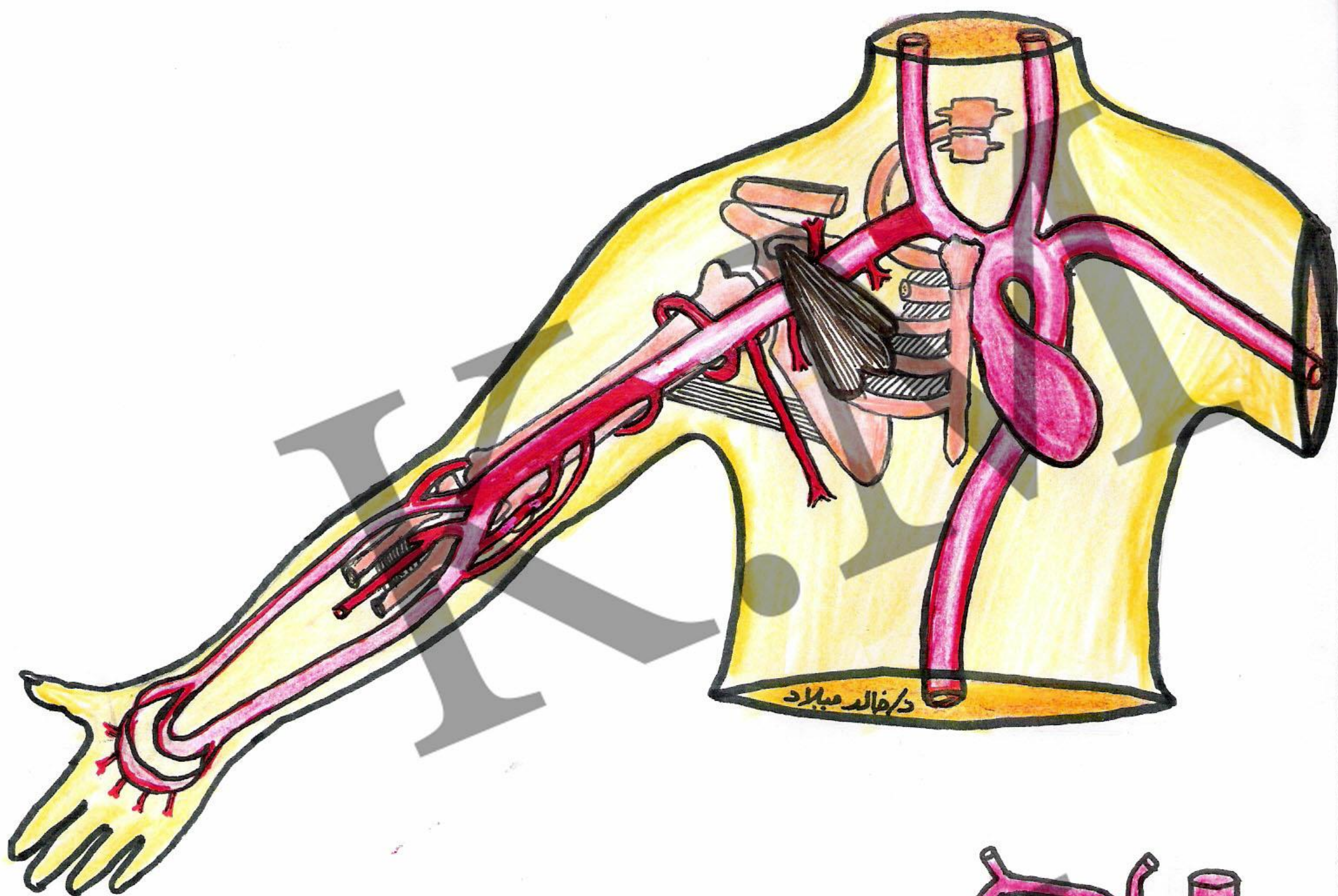
NB:- Subscapular artery also called thoracodorsal artery after giving circumflex scapular branch.

NB:- Axillary Nerve also called circumflex humeral Nerve accompanying circumflex humeral vessels. around surgical neck of humerus

NB:- Suprascapular nerve is accompanied by suprascapular artery in suprascapular notch, the artery passes above suprascapular ligament while nerve under it.

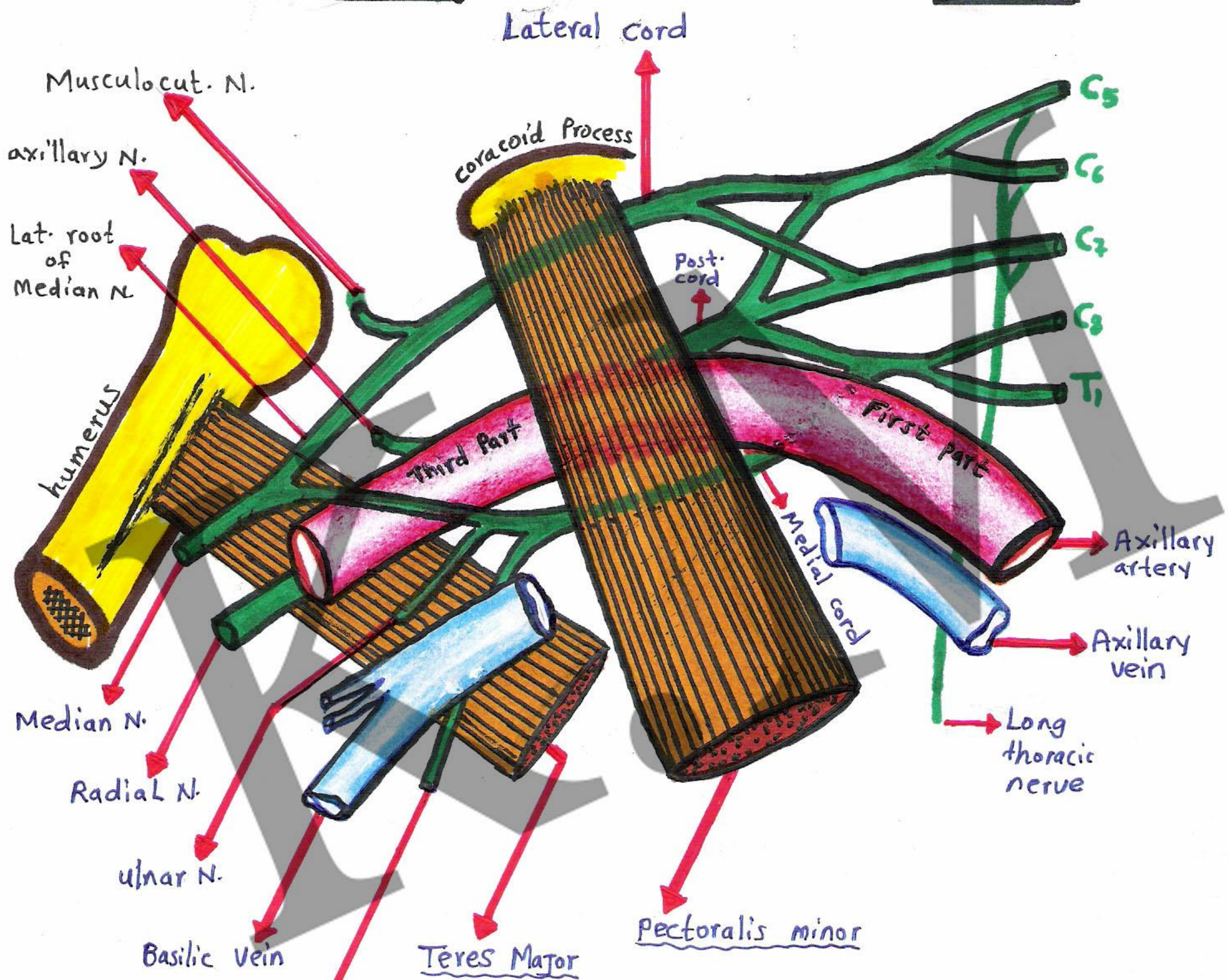


ARTERIES & ANASTOMOSIS OF UPPER LIMB



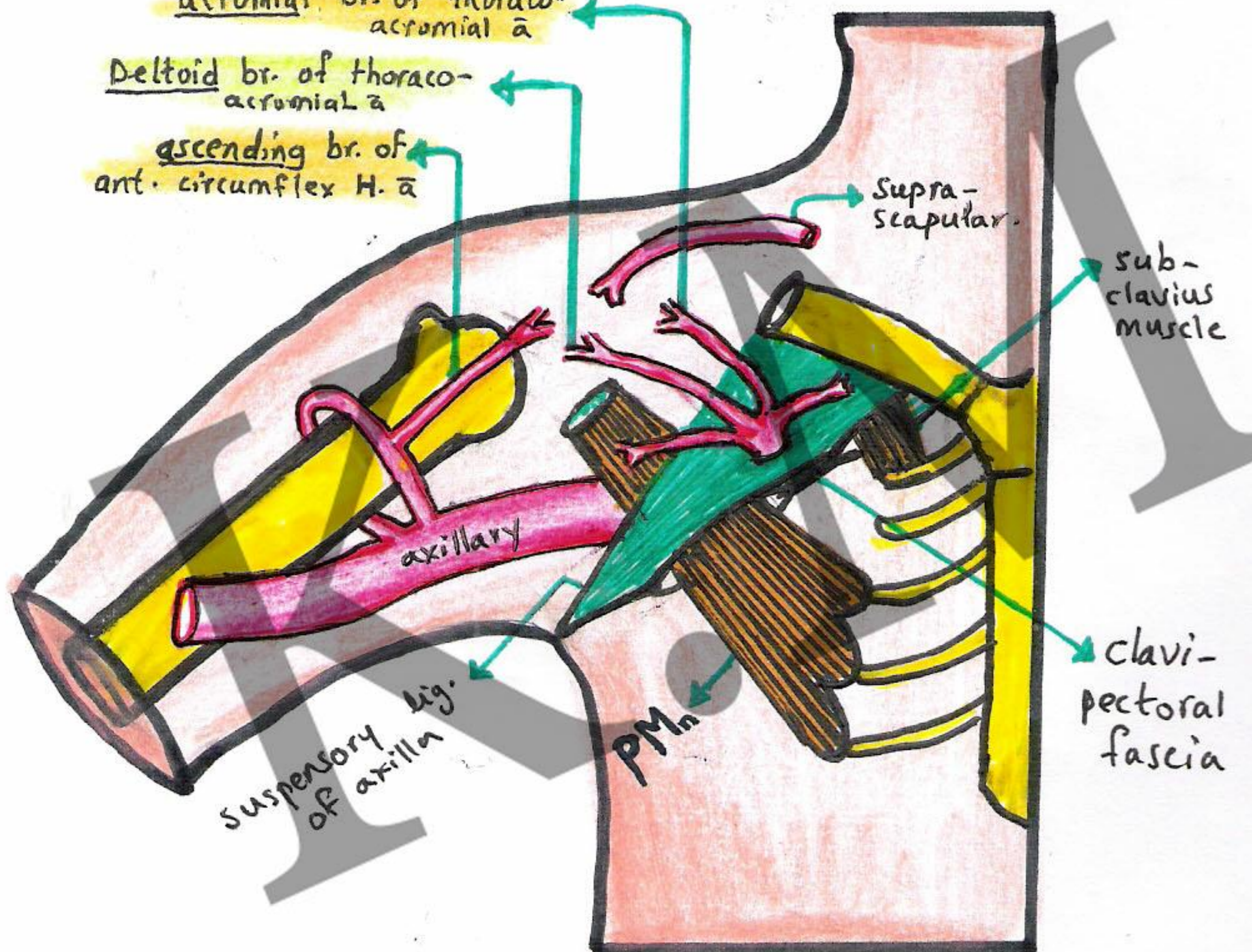
ARTERIES & ANASTMOSIS
OF UPPER LIMB

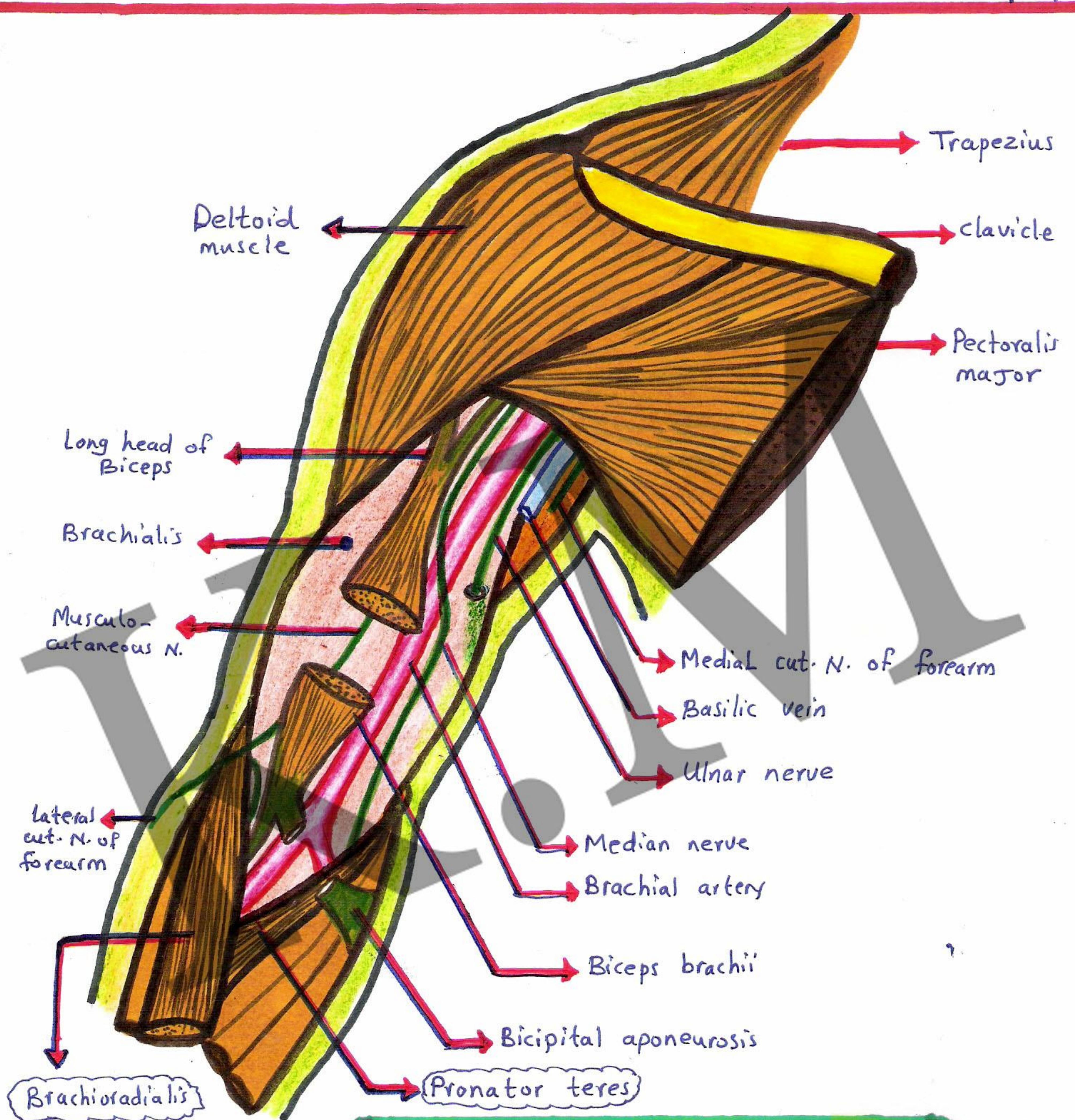
RELATION OF AXILLARY A.



acromial br. of thoraco-acromial a.
 Deltoid br. of thoraco-acromial a.
 ascending br. of ant. circumflex H. a.

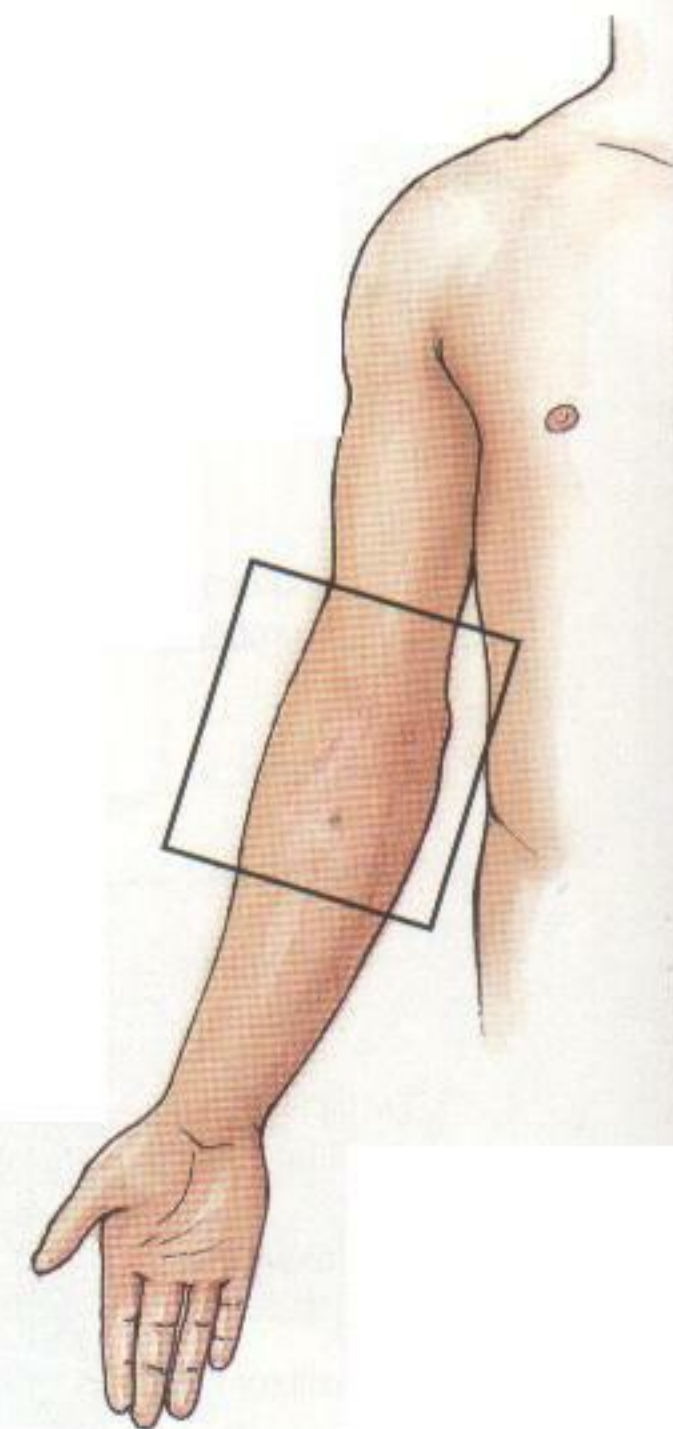
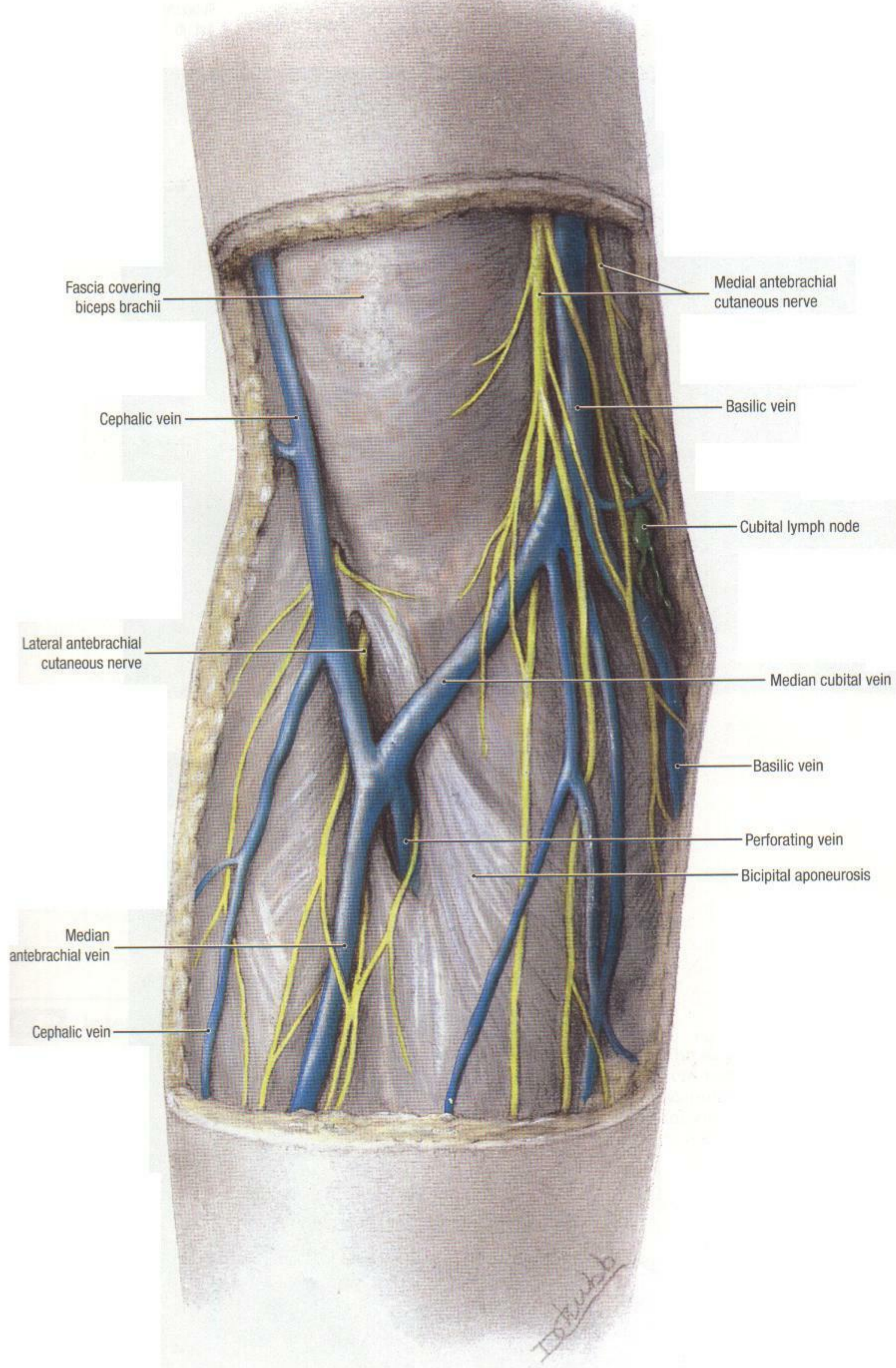
ANASTOMOSIS
 AROUND THE
 SHOULDER

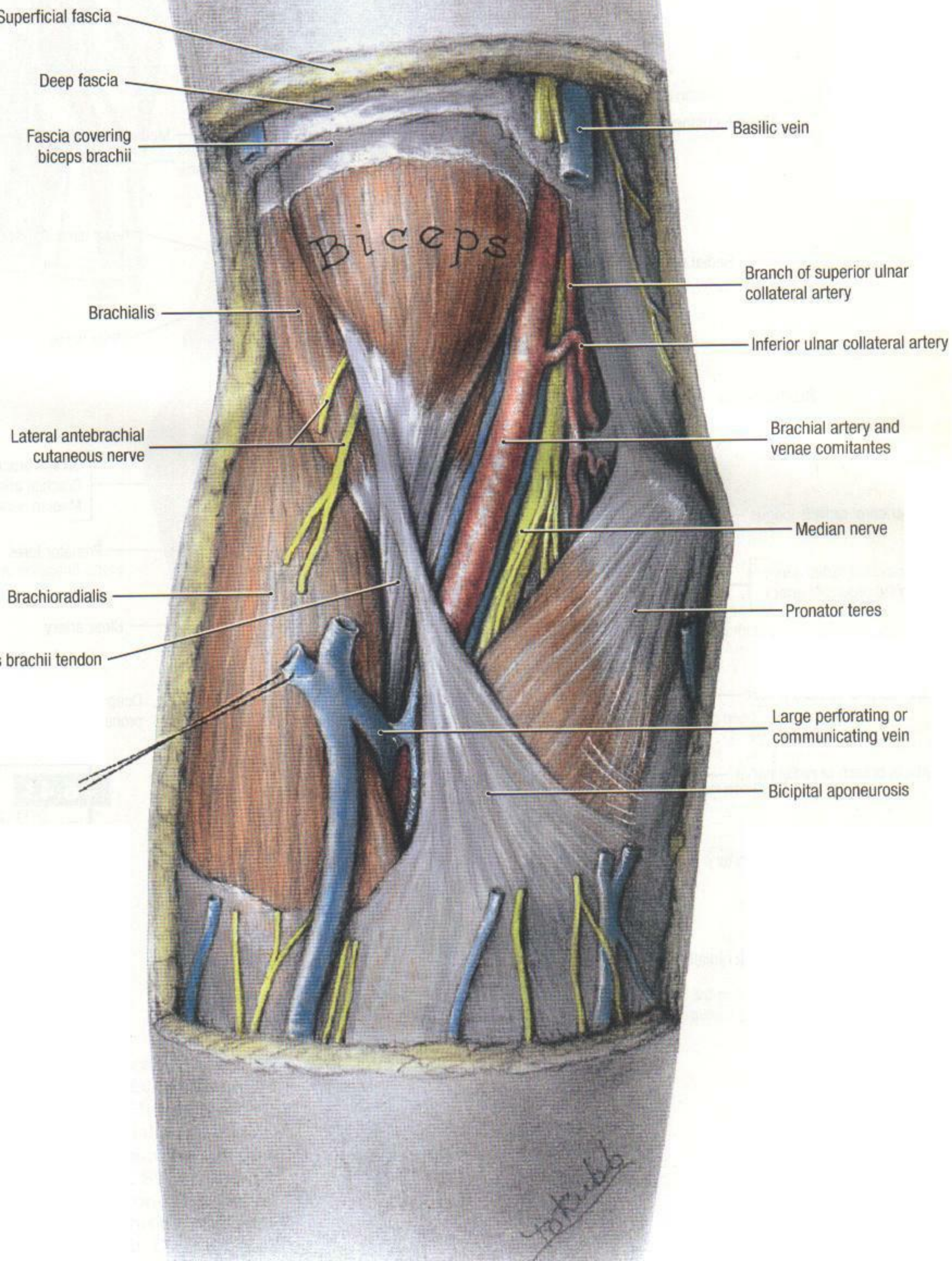


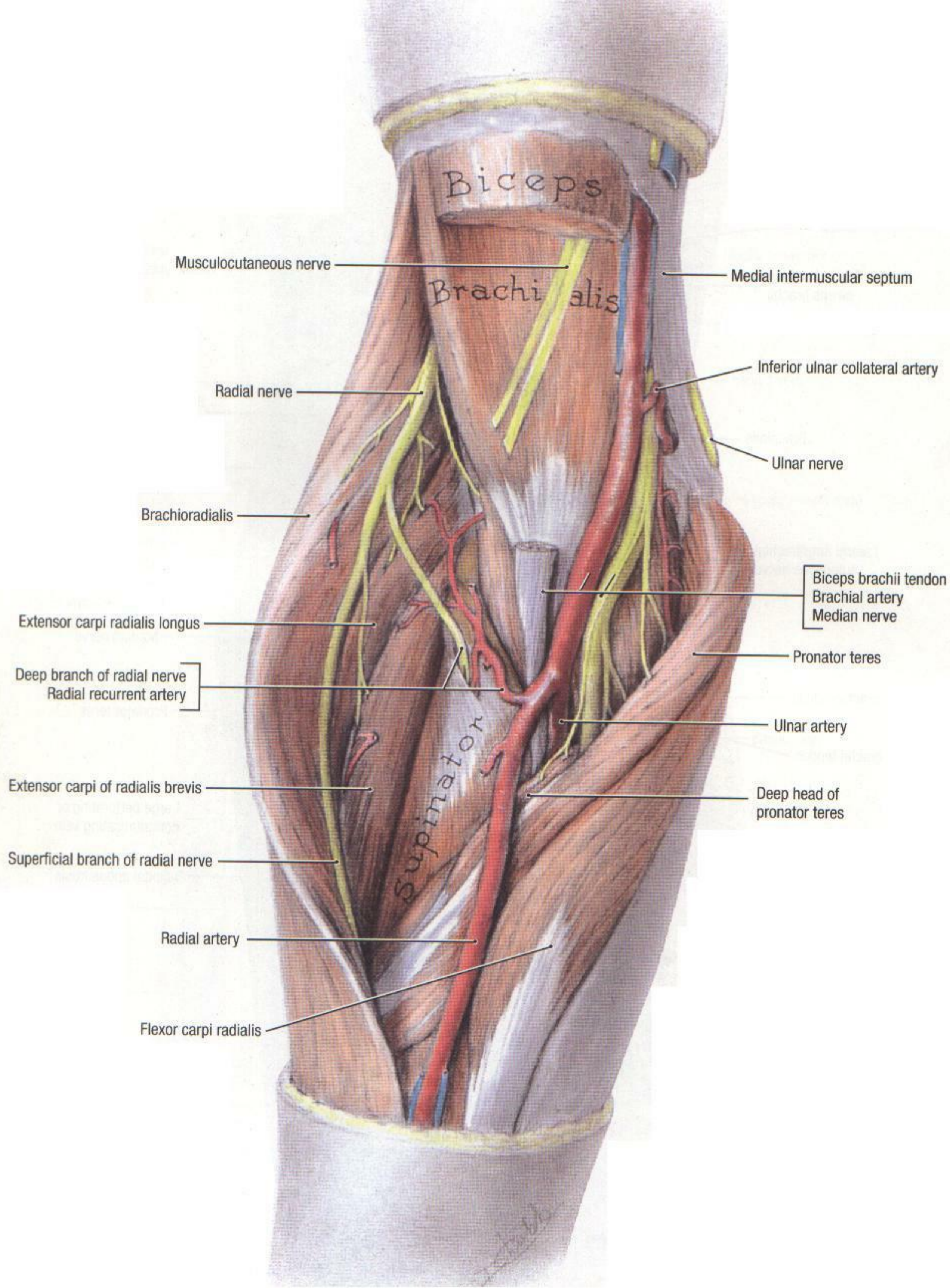


RELATION OF BRACHIAL ARTERY

CUBITAL FOSSA







MUSCLES OF AXILLA & ARM

(I) MUSCLES AROUND THE AXILLA:

(A) Muscles connecting the upper to thoracic wall:-

- | | |
|---------------------|-----------------------|
| 1- pectoralis major | 3- subclavius. |
| 2- Pectoralis minor | 4- Serratus anterior. |

(B) Muscles connecting the upper to Vertebral column:-

- | | |
|----------------------|--------------------|
| 1- Trapezius. | 4- Rhomboid minor. |
| 2- Latissimus dorsi. | 5- Rhomboid major. |
| 3- Levator scapulae | |

(C) Muscles connecting the scapula to humerus:

- | | |
|-----------------|-------------------|
| 1- Teres major. | 4- Supraspinatus. |
| 2- Teres minor. | 5- infraspinatus. |
| 3- Deltoid. | 6- Subscapularis. |

(II) MUSCLES OF THE ARM:

(A) Muscles of anterior compartment:

- 1- Biceps brachii.
- 2- Brachialis.
- 3- Coraco-brachialis.

(B) Muscles of Posterior compartment:

- Triceps muscle. (Triceps brachii).

NB: Origin, insertion, nerve supply & action → Discussed later.

INTERMUSCULAR SPACES

I- QUADRANGULAR SPACE

- * **Boundaries:-**
- Above: Teres minor, subscapularis & shoulder joint capsule.
 - below: Teres major.
 - Medial: Long head of triceps.
 - Lateral: Surgical neck of humerus.
- * **Contents:-** axillary nerve & posterior circumflex humeral vessels.

II- TRIANGULAR SPACE "UPPER"

- * **Boundaries:-**
- Above: Teres minor & subscapularis.
 - below: Teres major.
 - lateral: Long head of triceps.
- * **Contents:-** circumflex scapular vessels.

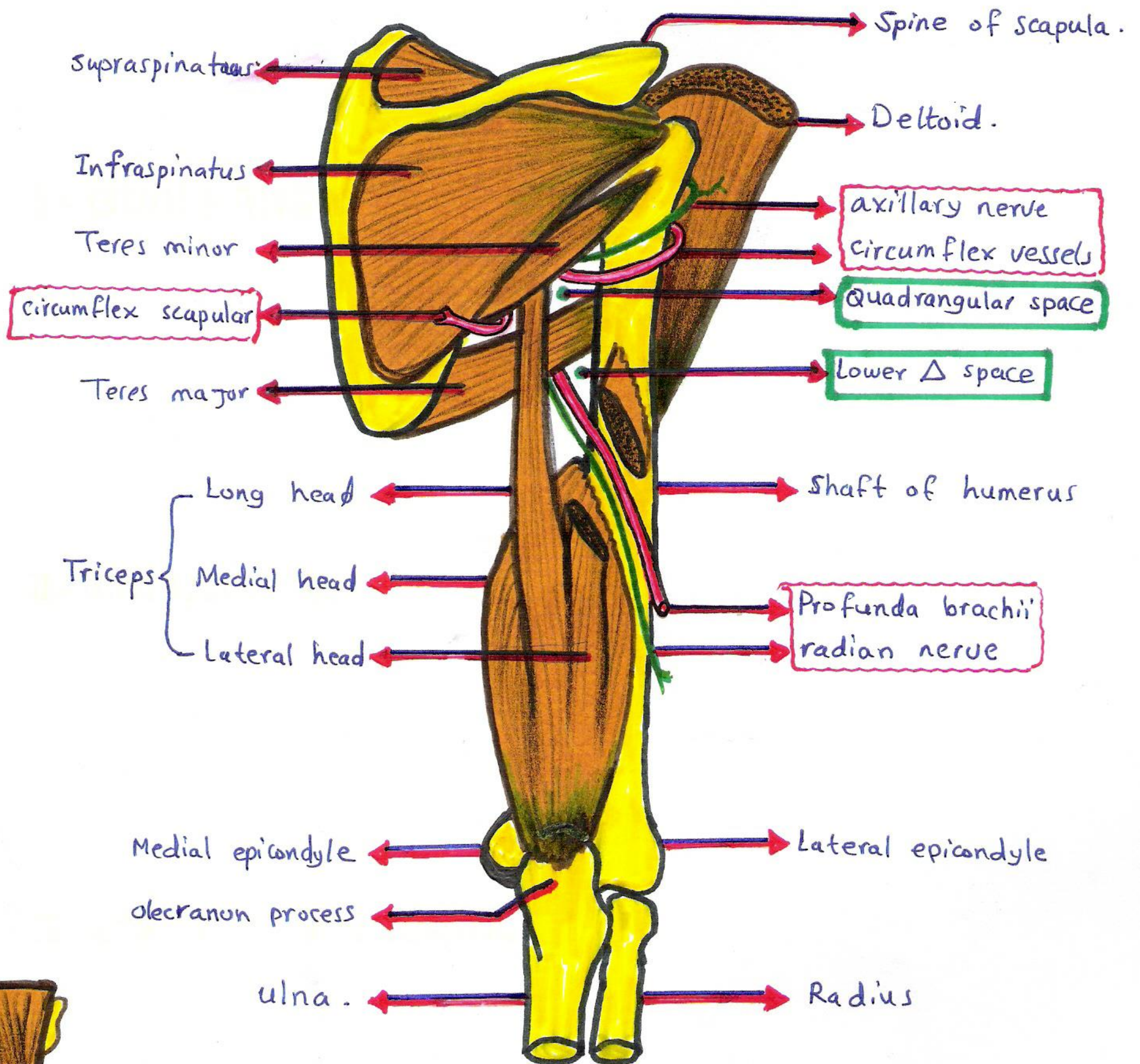
III- LOWER TRIANGULAR SPACE

- * **Boundaries:-**
- Above: Teres major.
 - lateral: shaft of humerus.
 - Medial: Long head of triceps.
- * **Contents:-** Radial nerve & profunda brachii vessels.

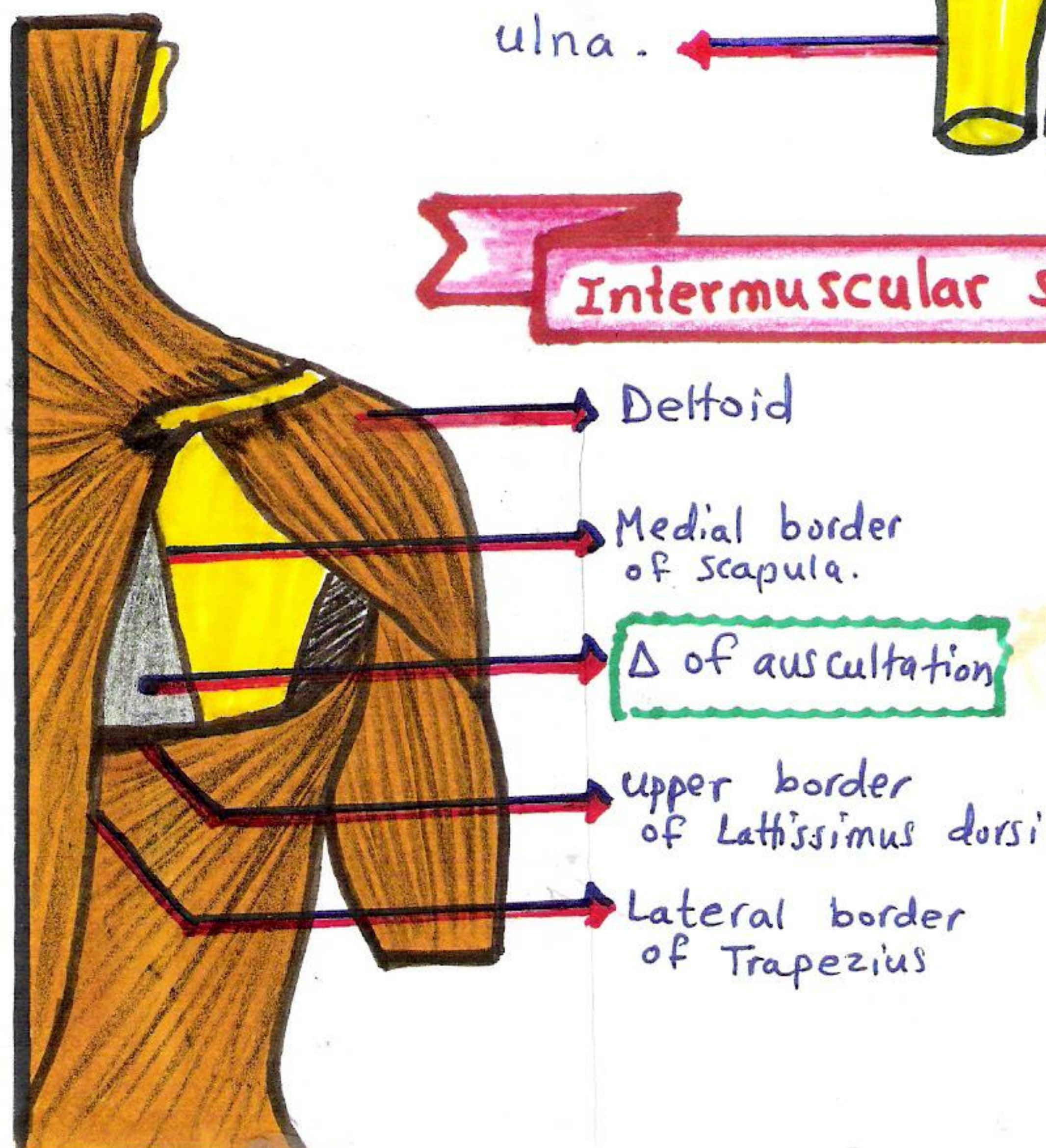
NB:- axillary nerve & circumflex humeral vessels wind around surgical neck of humerus.

NB: radial nerve & profunda brachii vessels run in the spiral groove of humerus.

NB: ulnar nerve & superior ulnar collateral vessels pierces the medial intermuscular ^{septum} space in the middle of arm to run behind medial epicondyle of humerus.



Intermuscular Spaces



Triangle of auscultation

- Above & Medial:
 - Lateral border of Trapezius.
- below :-
 - upper border of Latissimus dorsi
- Lateral:
 - medial border of scapula
- Floor :-
 - Rhomboid major, 6th & 7th ribs with intercostal space.

Suprascapular nerve
Anastomosis between suprascapular
and circumflex scapular arteries

Infraspinatus

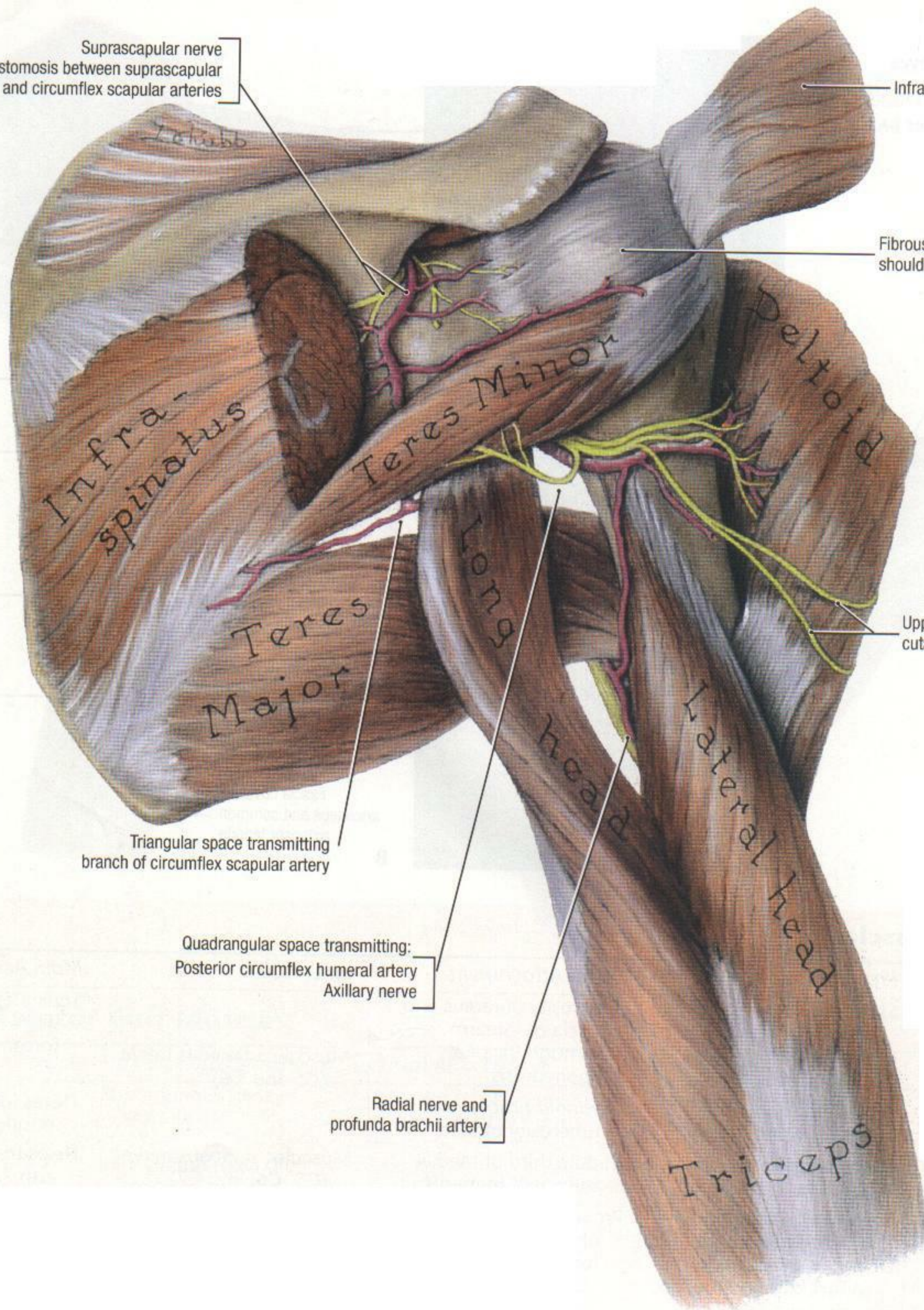
Fibrous capsule of
shoulder joint

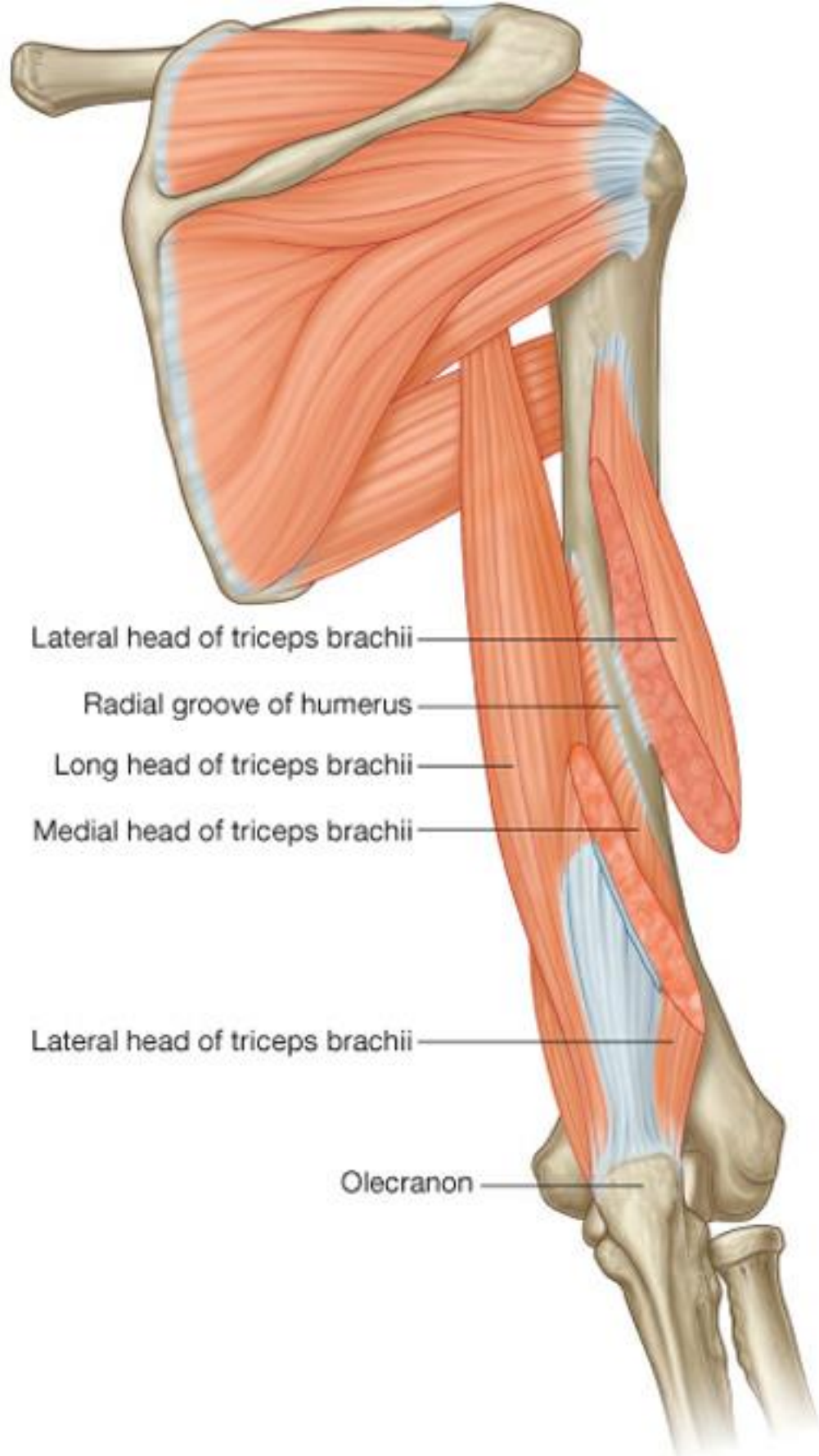
Upper lateral brachial
cutaneous nerve

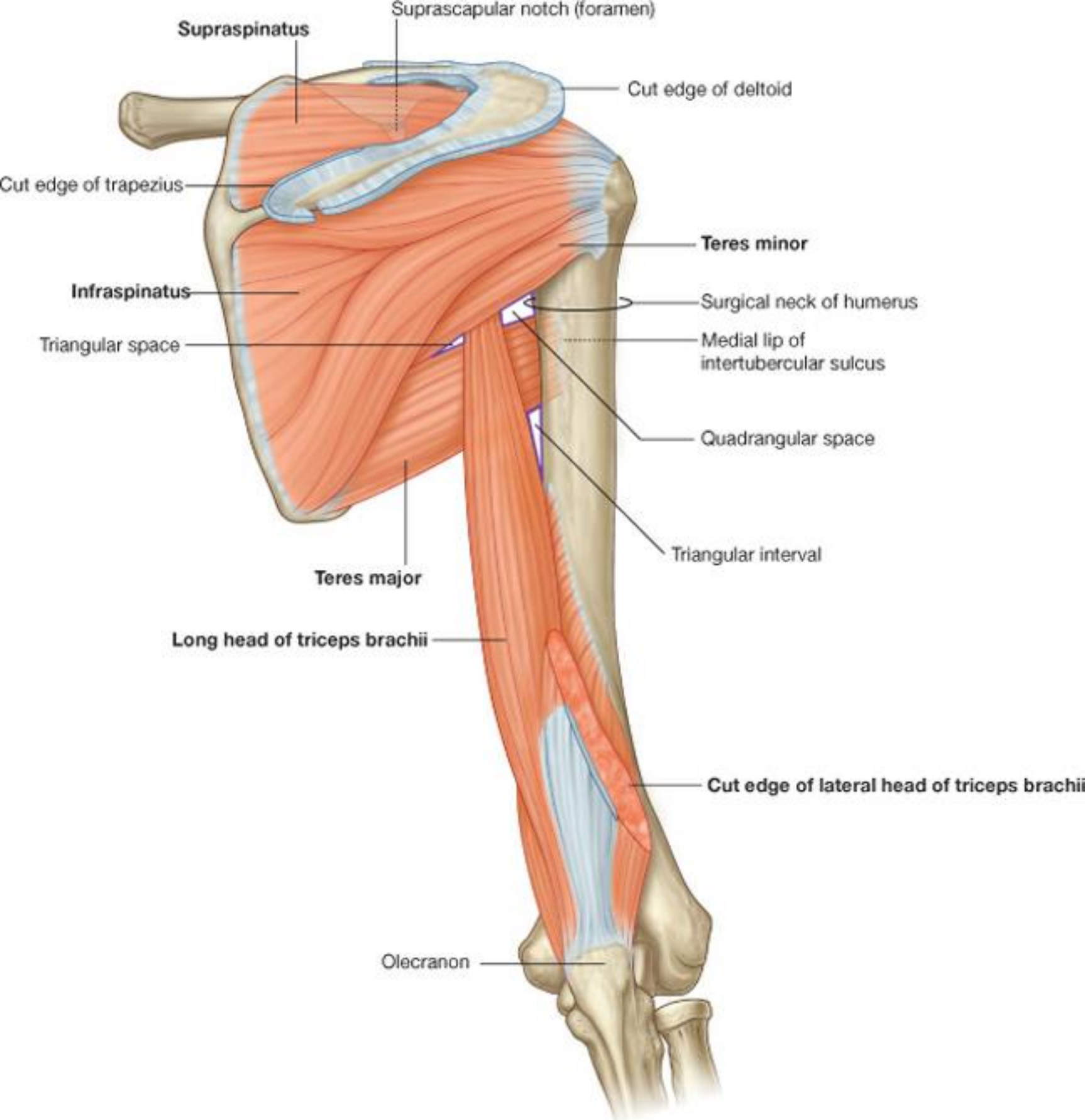
Triangular space transmitting
branch of circumflex scapular artery

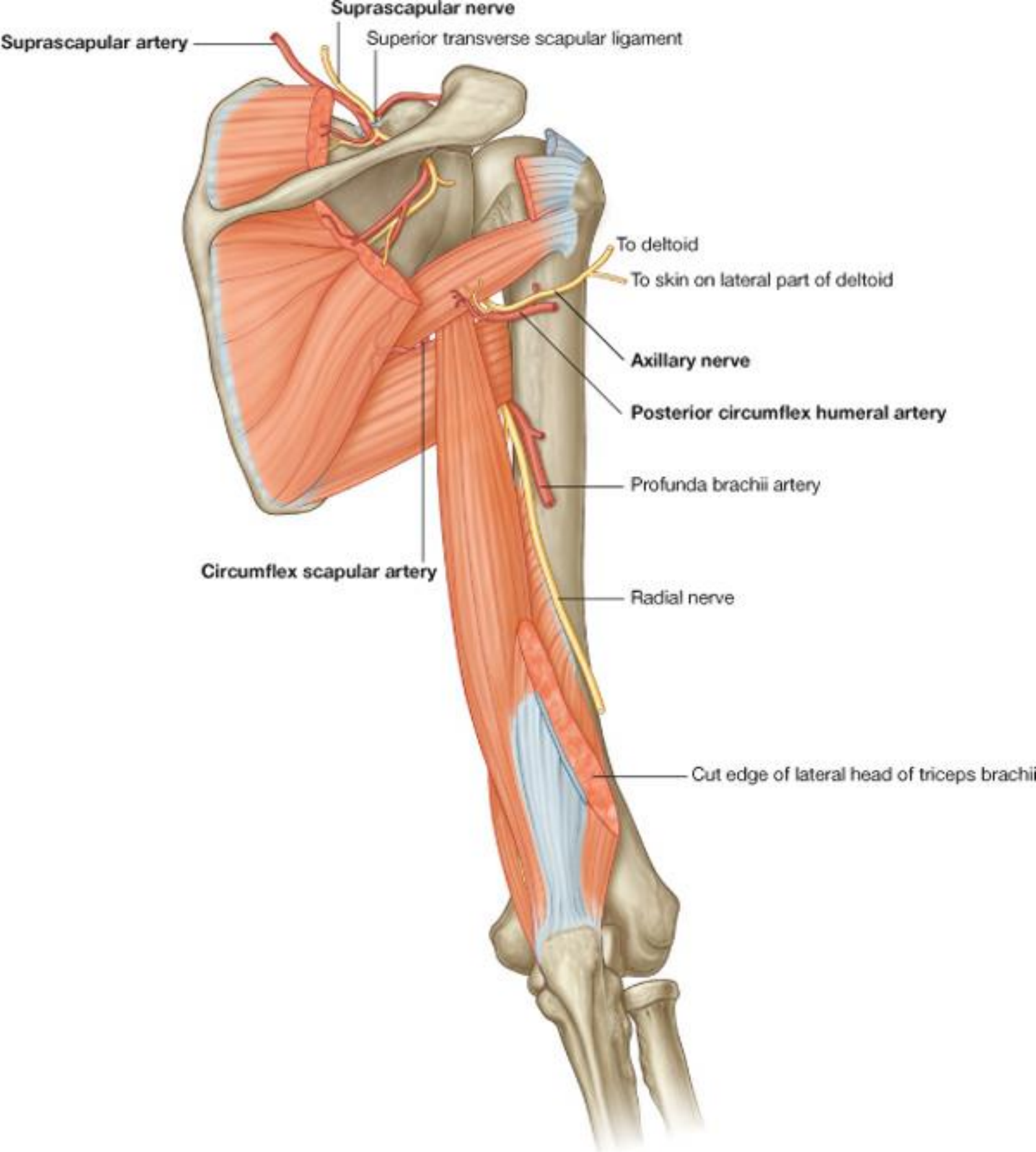
Quadrangular space transmitting:
Posterior circumflex humeral artery
Axillary nerve

Radial nerve and
profunda brachii artery









CUBITAL FOSSA

* Definition:-

- A triangular depression in front of elbow (apex downward).

* Boundaries:-

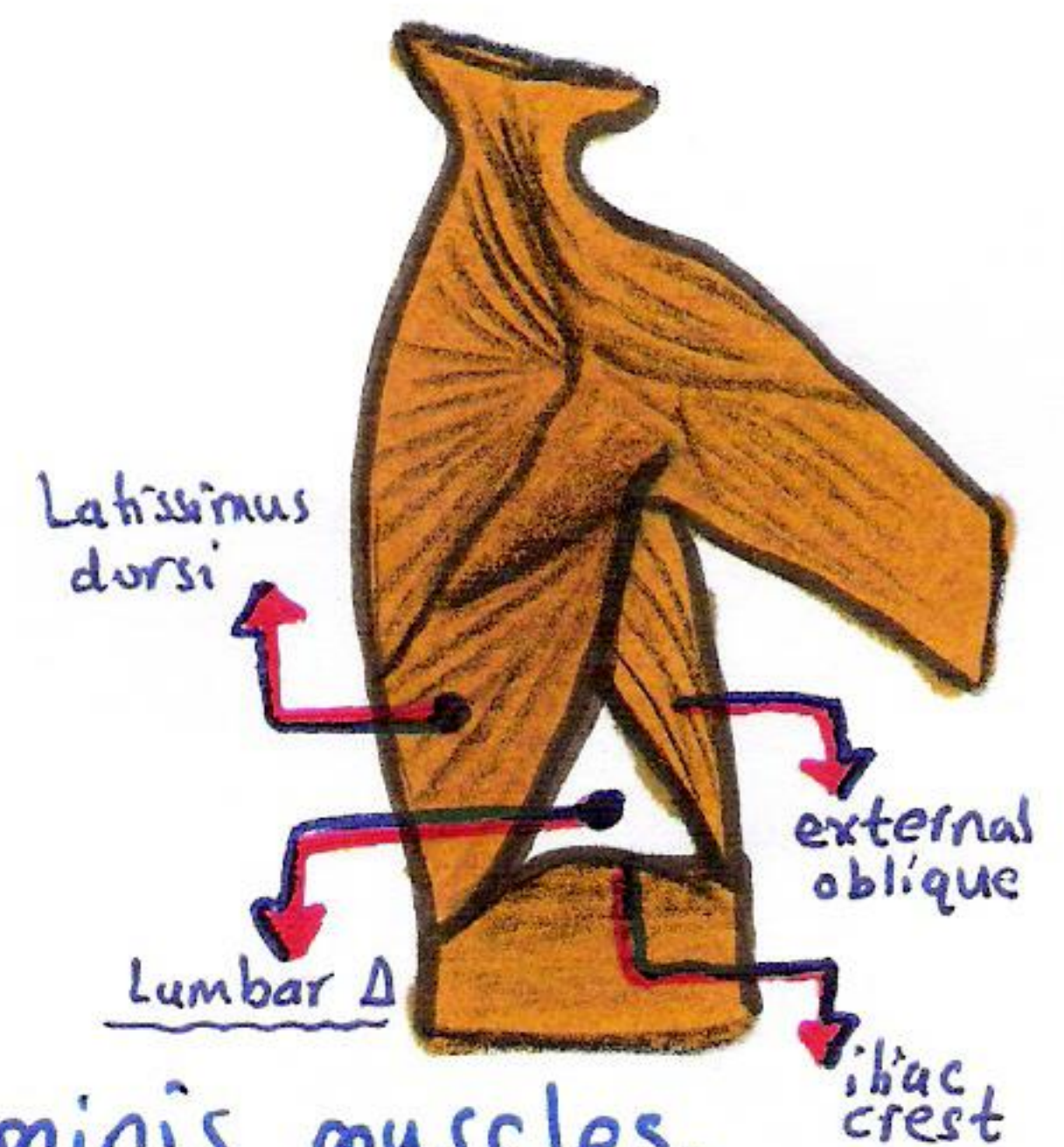
- Medially: Pronator teres (lateral margin).
- Laterally: Brachio-radialis (Medial margin).
- Base: imaginary line between two epicondyles of humerus.
- Apex: Meeting of medial & lateral boundaries.
- Floor: supinator & brachialis.
- Roof: Skin, fascia & bicipital aponeurosis & median cubital vein.

* Contents:- (from medial to lateral)

- 1 - Median nerve.
- 2 - Brachial artery [with its terminal branches: ulnar & radial a].
- 3 - Bicipital tendon.
- 4 - Radial nerve. [with its deep branch.].

LUMBAR TRIANGLE

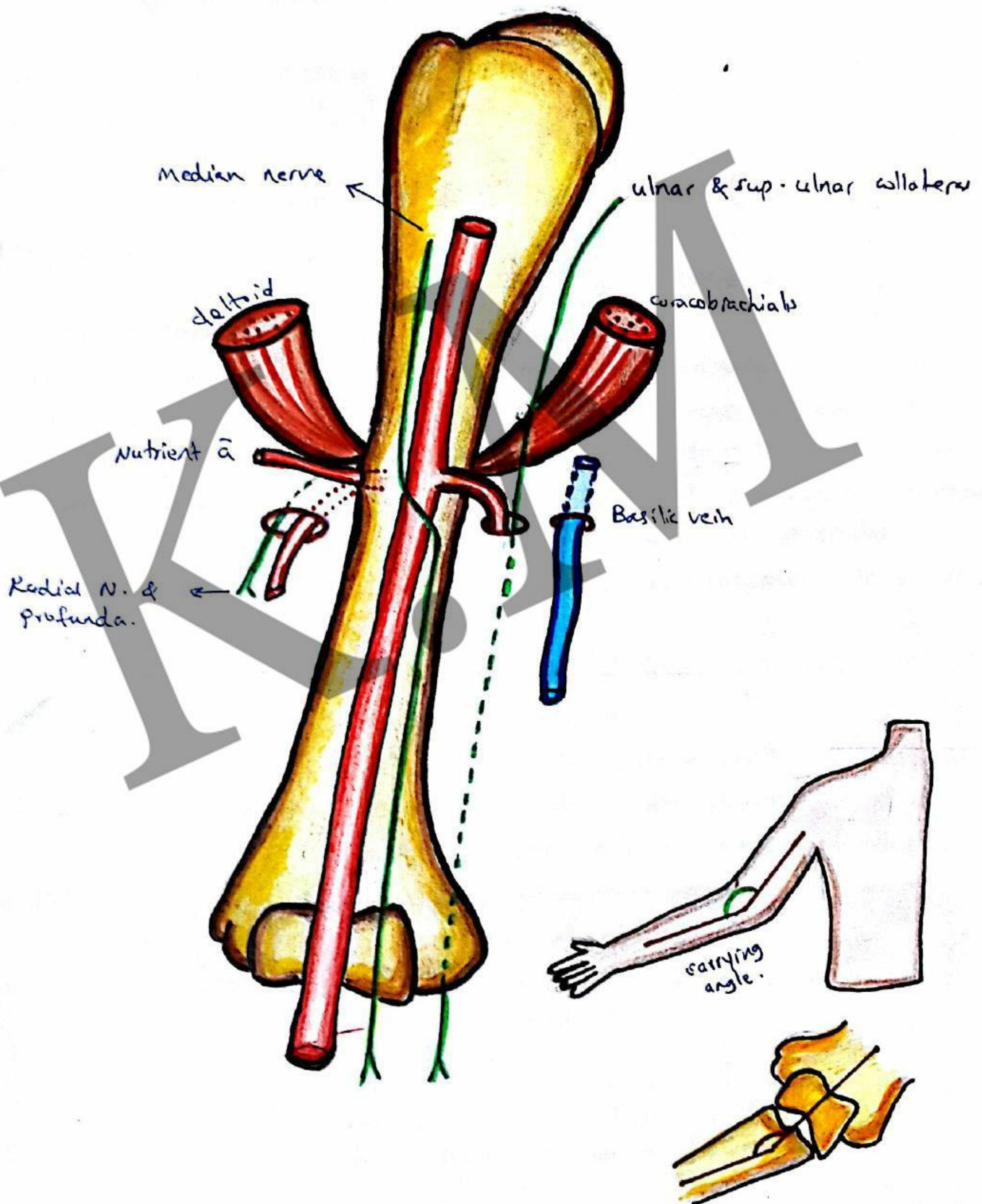
- **Medial:-** Latissimus dorsi (lateral border).
- **Lateral:-** External oblique (Posterior border).
- **Below:-** iliac crest.
- **Floor:-** Internal oblique & transversus abdominis muscles.



Events at middle of arm: see page (21)

1. Insertion of coracobrachialis (medially) & Deltoid (laterally).
2. Nutrient artery enters humerus.
3. Basilic vein pierces deep fascia.
4. Medial cut. N. of forearm pierces deep fascia.
5. Ulnar nerve & superior ulnar collateral a pierce med. intermuscular septum
6. Radial N. & profunda brachii pierces Lateral intermuscular septum
7. Median N. crosses in front of brachial artery from lat. to Medial

Events at mid arm.



NERVES OF UPPER LIMB

* AXILLARY NERVE

"circumflex N."

* Origin :-

- Arise from posterior cord of brachial plexus (C5, 6)

* End :-

- Ends deep to deltoid by dividing into anterior & post. branches.

* Course & relation :-

- Arise in axilla ^{behind 3rd part axillary artery} and leaves it through quadrangular space winding around surgical neck of humerus (accompanied by posterior circumflex humeral vessels) close to shoulder capsule.
- Ends under deltoid by dividing into ant. & posterior branches
- Anterior division passes to anterior border of deltoid.
- Posterior division continues as "Upper lateral cutaneous N. of arm"

* Branches :-

1. From trunk :- articular branch : to shoulder.
2. From ant. division :- Muscular :- to deltoid.
 - Cutaneous :- to skin over lower $\frac{1}{2}$ of deltoid.
3. From Post. division :- Muscular :- to Teres minor [& post. part of deltoid]
 - Cutaneous :- upper lat. cut. nerve of the arm.

* APPLIED ANATOMY : injury of axillary N. :-

- **Mechanism:**
 - Fracture of surgical neck of humerus
 - Dislocation of shoulder.
 - Compression by crutches.
- **Effect:**
 - * **Motor:** - paralysis of deltoid & Teres minor
 - Loss of abduction from 15 to 90
 - **Flat shoulder** due to flattening of deltoid $\rightarrow$ prominent acromion.
 - * **Sensory:** loss of sensation over lower part of deltoid.

LONG THORACIC N.

* Origin :-

- From root of brachial plexus (in the neck) "C5.6.7"

* End :-

- By supplying serratus anterior "N. to serr. anterior".

* Course & relation :-

- Descends behind trunks of brachial plexus.
- Enters the axilla behind 1st part of axillary artery.
- Descends vertically on surface of serratus anterior in the midaxillary line.

* Branches :-

- Motor to serratus anterior muscle.

APPLIED ANATOMY "injury of LTN"

- **Mechanism:** e.g during surgical removal of breast.
- **Effect:** Motor:- Paralysis of serr. ant → Loss of protraction of upper limb and retraction of scapula by rhomboids → **Winged scapula.**

SUPRASCAPULAR N.

* Origin :-

- Arise from upper trunk of brachial plexus (in neck) "C5.6"

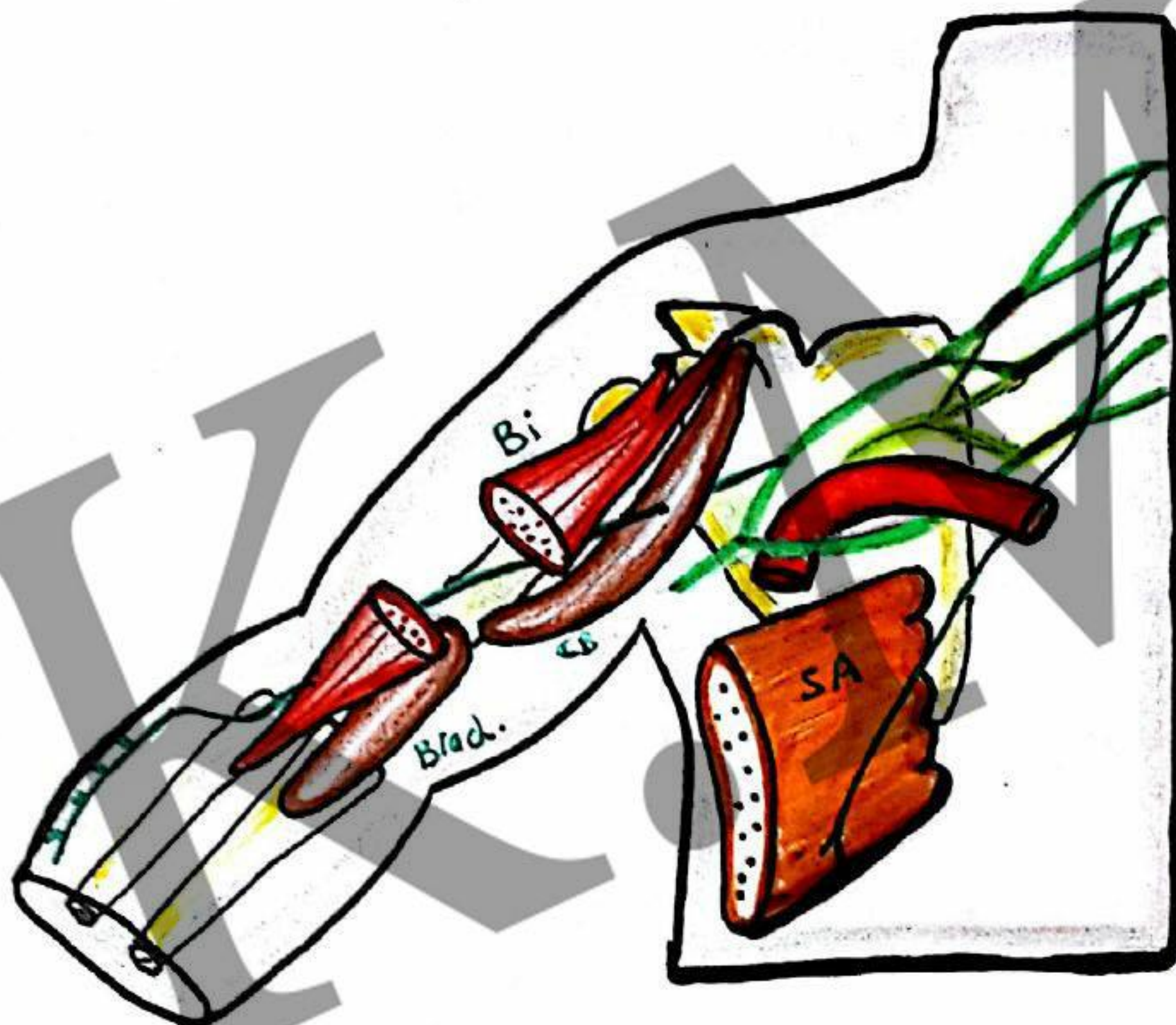
* Course & relation :-

- Descends behind the clavicle reaching upper border of scapula, runs below suprascapular ligament [through suprascapular notch] to enter supra spinous fossa under the muscle and pass through spinoglenoid notch to enter infraspinous fossa.
 - it passes together with suprascapular artery but the artery runs above suprascapular ligament.

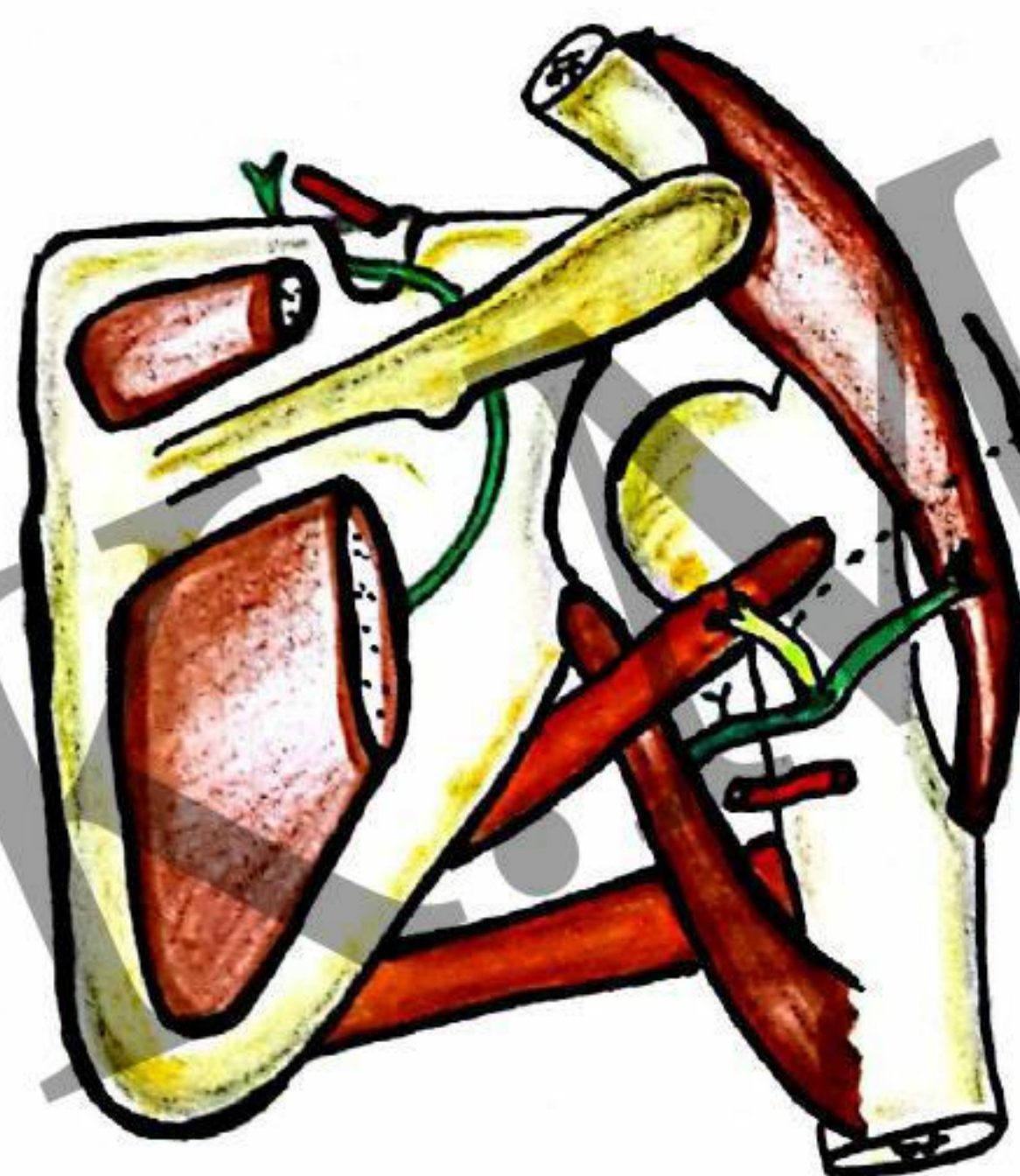
* Branches :-

- ① - Muscular:- to supraspinatus & infraspinatus.
- ② - Articular:- to acromioclavicular & shoulder joint.

Nerves of upper L.



musculo cut. N.
& LTN.



suprascapular & axillary N.

MUSCULO-CUTANEOUS N.

* Origin :-

- Arise from lateral cord of brachial plexus (in axilla) "C5.6.7".

* End :-

- Ends as Lateral cut. N. of forearm. (by piercing deep fascia)

* Course & relation :-

- runs lateral to 3rd part of axillary artery, enters the arm by piercing coracobrachialis ms and descends between Biceps & brachialis
- ends by piercing deep fascia (lateral to bicipital tendon) and continues as Lateral cut. nerve of forearm.

* Branches :-

- ① Muscular :- to (BBC), Biceps brachii, Brachialis & Coracobrachialis.
- ② Cutaneous :- (lat. cut. N. of forearm) to lateral side of forearm skin.
- ③ Articular :- to elbow.

APPLIED ANATOMY :-

* Injury to upper trunk of brachial plexus "C5.6"

• Erb's paralysis :- "Waiter's tip"

- due to paralysis of muscles supplies by upper trunk of brachial plexus [muscles attached to scapula, Biceps, brachialis, brachioradialis and supinator] which act as abductors & lateral rotators of shoulder, flex elbow & supinate forearm
- effect is "porter's tip deformity" :-
 - ① arm hangs by side, adducted.
 - ② extended elbow, pronated forearm

* Injury to lower trunk :-

• Klumpke's paralysis :- "claw hand"

- paralysis mainly to intrinsic muscles of hand with partial affection of flexor digitorum profundus.
- effect is "claw hand deformity"
 - ① Extension at metacarpo-phalangeal joints
 - ② flexion at interphalangeal joints specially medial 2 fingers.
- NB:- wrist is not severely affected [flexor carpi ulnaris ms is supplied by C7].

MEDIAN NERVE: C₅.6.7.8.T₁.

*** Origin :-**

- Arise from lateral root (from lateral cord) and a medial root (from medial cord) of brachial plexus [in axilla].

*** End :-**

- By dividing into lateral and medial divisions at the distal border of flexor retinaculum in hand.

*** Course & relation :-**

• In arm :

- Descends lateral to upper part of brachial artery up to the middle of arm where it crosses in front of it to descend medial to artery entering to cubital fossa.
- In cubital fossa lies ~~between~~ ^{medial to} brachial artery & bicipital tendon, covered by bicipital aponeurosis & brachialis under it.

• In forearm :

- Leaves cubital fossa by passing between 2 heads of the pronator teres [where it separated from ulnar artery by deep head of pronator teres].
- Descends between FDS above & FDP below it
- About 5 cm above wrist, it emerges from lateral border of FDS to lie between FCR & palmaris longus tendons.
- Enters the hand through carpal tunnel, deep to flexor retinaculum & superficial to FDS.

• In hand :

- leaves carpal tunnel & ends at distal border of flexor retinaculum by dividing into lateral & medial divisions which divide into Palmar digital branches.

*** Branches :-**

• In arm :-

- No branches EXCEPT a small vasomotor nerve to the brachial artery.

NB:- FDS = Flexor Digitorum Superficialis. FDP = Flexor digitorum Profundus.
FCR = Flexor Carpi radialis. FCU = Flexor carpi ulnaris

• In forearm: (Median nerve)

- ① Muscular:- to Pronator teres (PT), FCR, FDS, Palmaris longus (PL)
- ② Articular:- to elbow joint & superior radioulnar joint.
- ③ Anterior interosseous nerve which gives:
 - Muscular:- to Flexor Pollicis longus (FPL), Pronator quadratus (PQ) and lateral 1/2 of FDP
 - Articular:- to wrist & inferior radio-ulnar joint.
- ④ Palmar cutaneous branch:- which crosses over flexor retinaculum to supply skin of lateral 2/3 of palm.
- ⑤ Communicating branch with ulnar nerve:- which consists of fibers of C7 that pass through ulnar nerve to supply flexor Pollicis brevis.

• In hand:

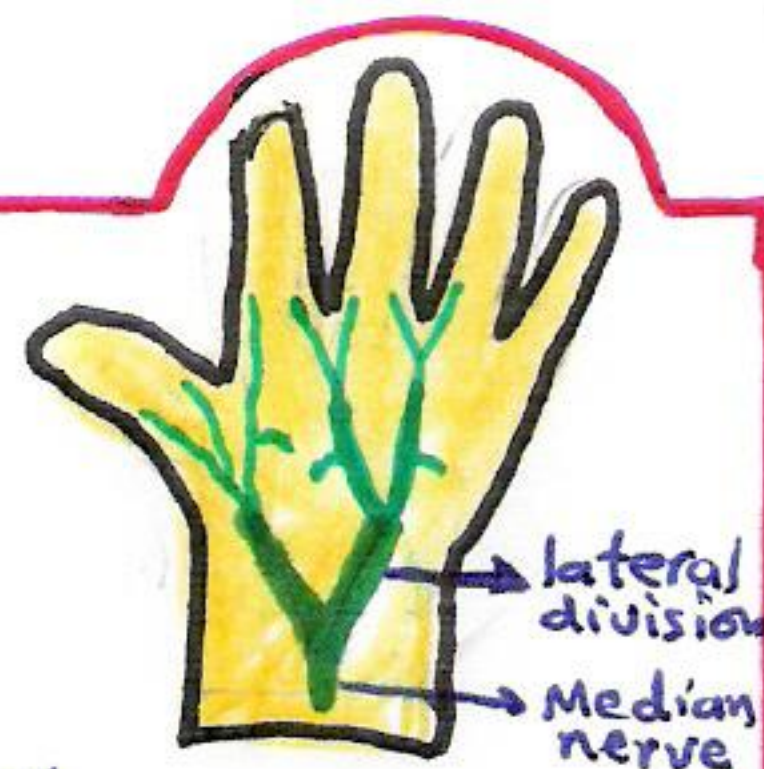
- ① Muscular (recurrent br.) to
 - Flexor pollicis brevis (FPB)
 - Abductor " " (Ab. PB)
 - Opponens pollicis.
- ② Palmar digital branch (5 branches):-

• Lateral division:- gives 3 palmar digital nerves:-

supply 2 sides of thumb & lateral side of index. , the nerve to index also supply 1st lumbrical muscle.

• Medial division: gives 2 palmar digital nerves:

supply adjacent sides of (index, middle), (middle, ring) fingers the lateral one of these 2 nerves gives a branch to 2nd lumbrical & the medial one communicates with palmar digital br. of ulnar nerve



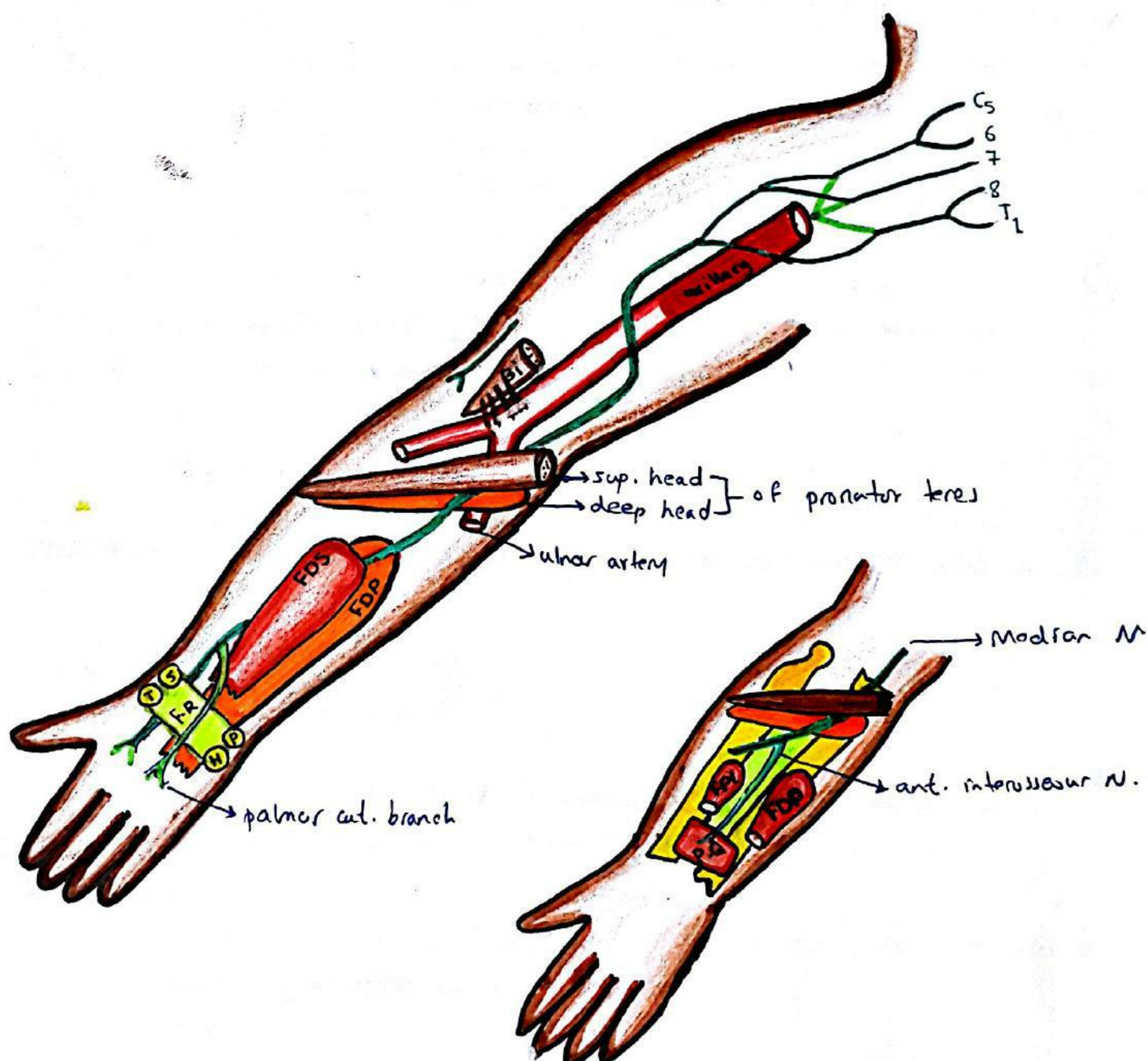
= Palmar digital branches supply the skin of lateral 3 1/2 fingers on palmar surface, sides and dorsum of distal phalanx of thumb & middle & distal phalanx of the other digits.

CLINICAL NOTE:

• Carpal tunnel syndrome:- compression of median nerve in the carpal tunnel by oedematous fluid or dislocation of one of the carpal bones.

- It results in same effects of injury of median nerve just above wrist (see next page)

Median nerve



APPLIED ANATOMY

Injury of median N. in axilla or arm :

- ① Loss of sensation at lateral 2/3 of Palm and lateral 3 1/2 fingers.
- ② Paralysis of thumb "Ape-like deformity" which is:
- Loss of flexion, opposition of thumb → thenar eminence wasting [adduction is intact].
- ③ Loss of pronation of forearm (Paralysis of PT & PQ).
- ④ Loss of flexion of proximal & middle phalanges of the medial 4 fingers (paralysis of FDS).
- ⑤ Loss of flexion of Distal phalanges of index & middle fingers (paralysis of lateral 1/2 of FDP).
- ⑥ Weak flexion of wrist (Paralysis of FCR & PL).

Injury Just above wrist [as in carpal tunnel syndrome]

- ① Ape-like deformity.
- ② Loss of thumb opposition.
- ③ Sensory loss in skin of lateral 3 1/2 fingers.

ULNAR NERVE

* Origin :-

- Arise from medial cord of brachial plexus (in axilla) "C₈. T₁"
"C₇ added to ulnar N. from lateral root of median N."

* End :-

- Ends in hand by dividing into superficial & deep divisions.

* Course & relation :-

• In arm :-

- enters to arm medial to brachial artery up to 1/2 of arm where it pierces medial intermuscular septum entering the posterior compartment accompanied by superior ulnar collateral a
- Enters forearm by passing behind medial epicondyle between 2 head of FCU.

• In forearm: (ulnar nerve).

- Descends on medial side of forearm (with ulnar artery)
Lies between FCU (above) and FDP (below) in upper 2/3 forearm
- Comes out from under lateral border of FCU to lie under skin & fascia in lower 1/3 of forearm.
- Enters hand over flexor retinaculum just lateral to pisiform where it divides into superf. & deep divisions.

• In hand

- a = Superficial division: passes medial to hook of hamate & gives its palmar digital branches to medial $1\frac{1}{2}$ fingers.
- b = Deep division: passes between F.D.M.B ^{Flexor digiti minimi brevis} & Ab.D.M ^{Abductor digiti minimi} in company with deep division of ulnar artery.
then it pierces opponens digiti minimi, curves around hook of hamate, continues laterally in concavity of deep palmar arch & ends in adductor pollicis muscle.

* Branches:

• In arm:

- No branches EXCEPT articular branch to elbow.

• In Forearm:

- ① Muscular:- to FCU & medial $\frac{1}{2}$ of FDP.
- ② Cutaneous:- Palmar cut. branch:- to skin of medial $\frac{1}{3}$ of palm.
- Dorsal cut. branch:- to medial $\frac{1}{3}$ of dorsum of hand and dorsum of medial $1\frac{1}{2}$ fingers

• In hand

① Superficial division:-

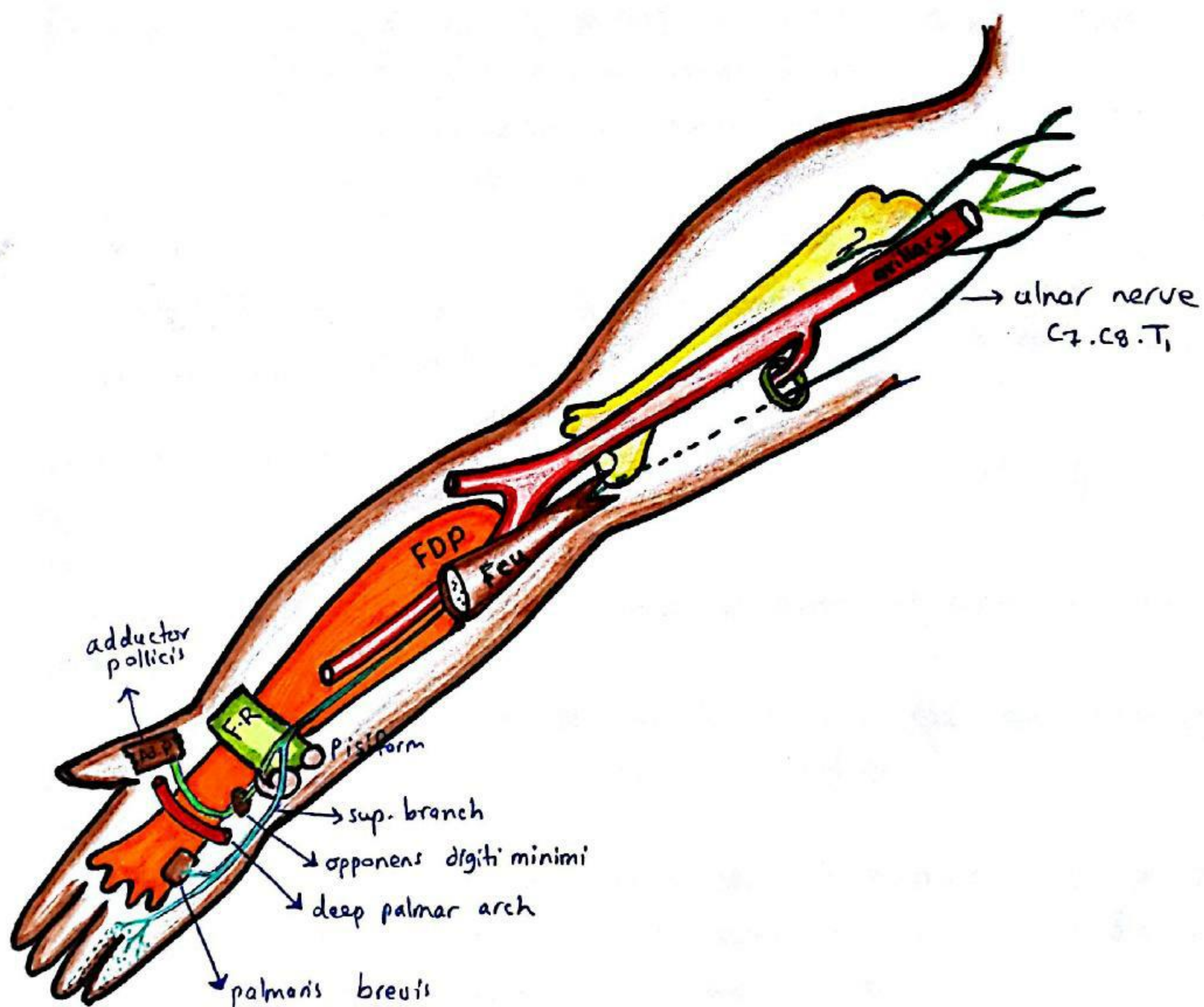
- Muscular: to Palmaris brevis
- Palmar digital nerves (2: medial & lateral):-
Lateral one: supplies adjacent sides of ring & little fingers (and communicates with medial Palmar digital br. of median N.)
Medial nerve: supplies medial side of little finger.



② Deep division:-

- Muscular:- to - Flexor, abductor & opponens digiti minimi.
- adductor pollicis.
- All interossei, third & fourth Lumbricals.
- Articular:- to wrist and metacarpophalangeal joints.
- vasomotor branches to palmar digital arteries of hand.

Ulnar nerve



*APPLIED ANATOMY:

*Injury to Ulnar nerve above elbow:-

- Loss of sensation at medial $\frac{1}{3}$ of hand (Palmar & dorsal) and skin of medial $1\frac{1}{2}$ fingers (Palmar & dorsal).
- Paralysis of FCU & medial $\frac{1}{2}$ of FDP & hand muscles which $\rightarrow$ weakness of flexion of little and ring fingers causing **Partial claw hand** with lateral deviation of hand.

*Injury at just above wrist :-

- causes **Claw hand** :- due to paralysis of **third & forth** Lumbricals $\rightarrow$ extension of metacarpophalangeal joints and flexion of interphalangeal joints of index & middle fingers.
- Loss of sensation of skin at medial $1\frac{1}{2}$ fingers.

RADIAL NERVE

*Origin :- (Largest br. of br. plexus)

- Arise from posterior cord of brachial plexus (in axilla) "C5.6.7.8.T1"

*End :-

- Ends in front of lateral epicondyle of humerus by dividing into deep & superficial terminal branches.

*Course & relation :-

- Enters the spiral groove on back of humerus by passing through lower triangular space accompanied by Profunda brachii artery $\rightarrow$ reaching lateral side of arm.
- Pierces lateral intermuscular septum to enter anterior compartment of arm (accompanied by anterior descending br. of Profunda a.).
- Lies between brachioradialis & extensor carpi radialis longus (laterally) and brachialis (medially.).
- in front of lateral epicondyle ends by giving the deep branch & continue as superficial terminal branch.

* Branches of radial N. :-

• In axilla :- (2 ms & 1 skin):

- ① Muscular:- to long & medial heads of triceps.
- ② Cutaneous:- Posterior cutaneous N. of arm.

• In spiral groove 'arm' (3 ms & 2 skin):

- ① Muscular:- to lateral & medial heads of triceps & anconeus.
- ② Cutaneous:- lower lat. cut. N. of arm & Post. cut. N. of forearm

• On lateral side of arm :- (3 ms & 1 joint):

- ① Muscular:- to brachialis (lateral part), brachioradialis & extensor carpi radialis Longus.
- ② Articular: to elbow joint.

• Terminal branches:-

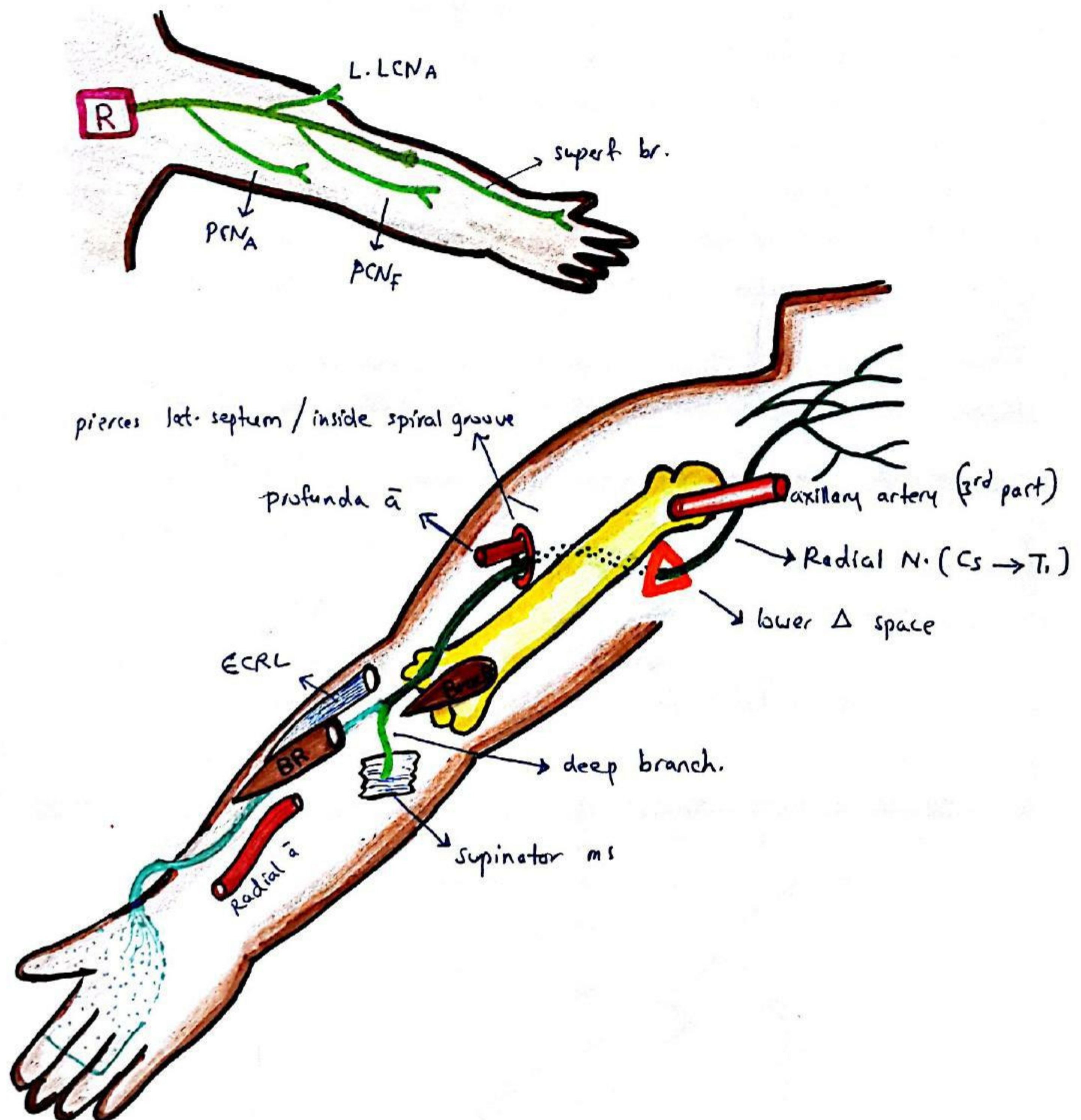
① Superficial radial branch (cutaneous)

- supply skin of lateral 2/3 of dorsum of hand & dorsum of proximal phalanges of lateral 3½ fingers
- It descends along lateral side of forearm lateral to radial artery (middle 1/3 of forearm) under cover of brachioradialis over muscles attached to radius.
- about 5 cm above the wrist it winds round lateral side of radius to reach back of hand.
- Ends by dividing into 5 dorsal digital branches over anatomical snuff box

② Deep branch (Posterior interosseous nerve):

- descends under brachioradialis, pierces supinator, winds around neck of radius to back of forearm passing between superficial & deep layers of muscles.
- accompanied by posterior interosseous artery to hand dorsum
- It gives muscular br. to muscles of posterior compartment muscles EXCEPT anconeus. Articular to wrist & carpal joints.

Radial nerve



APPLIED ANATOMY :

• Injury of radial nerve in spiral groove :-

- Causes Wrist drop & finger drop - Which caused due to Paralysis of muscles of back of forearm [triceps not completely ^{paralysed}]
- Loss of sensation along all cutaneous branches of radial nerve EXCEPT Post. cut. N. of arm (given in axilla).

• Injury to superficial branch :-

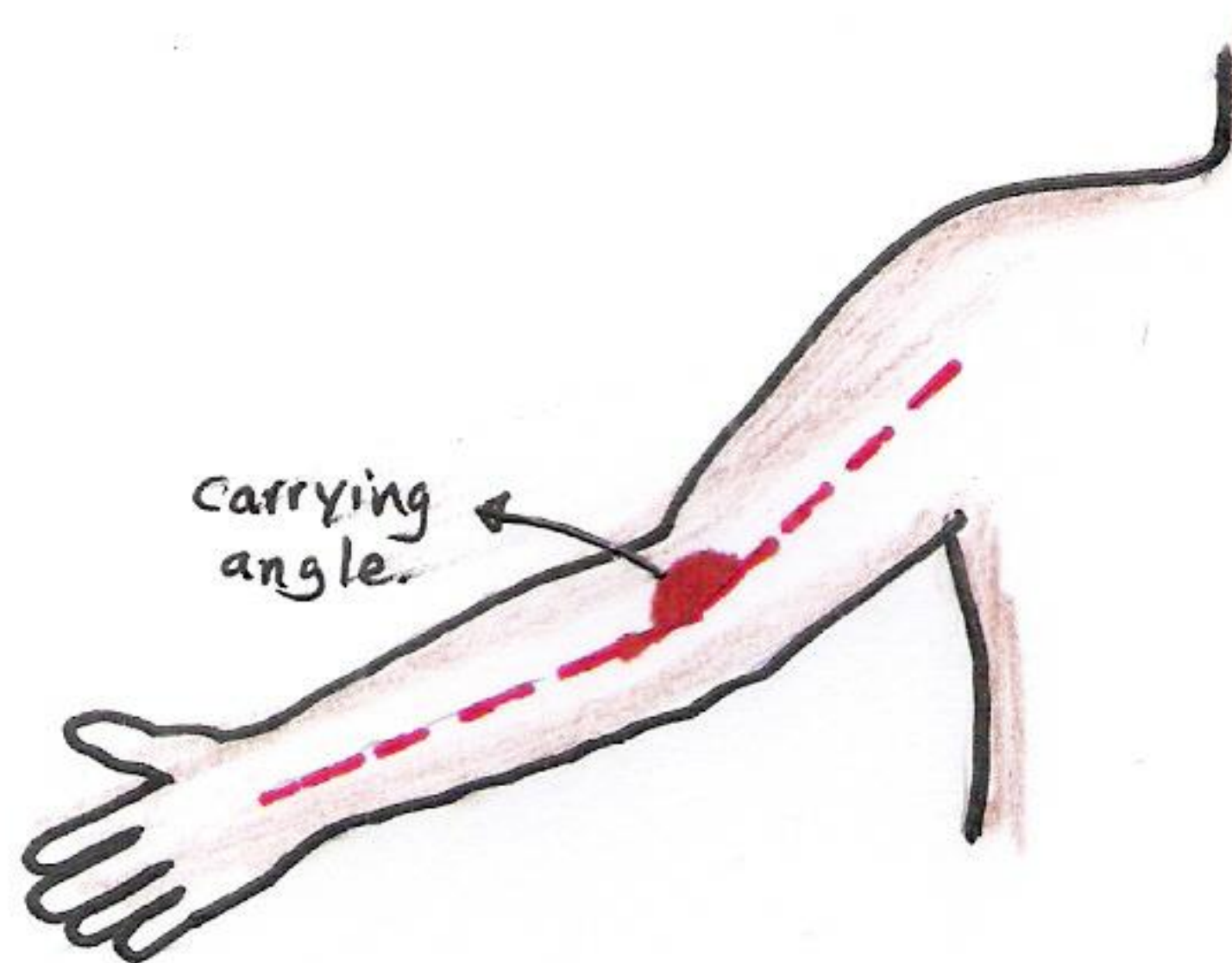
- Loss of sensation on lateral 2/3 of dorsum of hand & the dorsum of proximal phalanges of lat. 3 1/2 fingers.

• Injury to deep branch :-

- causes Wrist drop & finger drop
- Loss of supination of extended elbow (due to Paralysed supinator) as supination of flexed elbow done by biceps brachii.

CARRYING ANGLE :

- Angle between long axis of arm & Forearm (extended & supinated)
- It is about 170 in male & 167 in female [opens laterally].
- Disappears when the elbow is flexed.
- Caused by projection of medial 1/2 of trochlea more than its lateral 1/2.



MUSCLES OF FOREARM

*Anterior compartment :-

- 1- Pronator teres (PT).
 - 2- Flexor carpi radialis (FCR).
 - 3- Flexor carpi ulnaris (FCU).
 - 4- Palmaris Longus (PL).
 - 5- Flexor digitorum superficialis (FDS).
 - 6- Flexor digitorum profundus (FDP).
 - 7- Flexor pollicis Longus (FPL).
 - 8- Pronator Quadratus (PQ).
- > superficial group.
- > intermediate.
- > Deep group.

*Lateral compartment :-

- 1- Brachioradialis (BR)
- 2- Extensor carpi radialis longus (ECR-L)

*Posterior compartment.

- 1- Anconeus.
 - 2- Supinator.
 - 3- Extensor carpi ulnaris (ECU).
 - 4- Extensor carpi radialis brevis (ECR-B).
 - 5- Extensor digitorum (ED).
 - 6- Extensor digiti minimi (EDM).
 - 7- Extensor indicis (EI).
 - 8- Extensor pollicis Longus (EPL).
 - 9- Extensor Pollicis brevis (EPB).
 - 10- Abductor Pollicis Longus (Ab. PL).
- } transverse.
- } Longitudinal.
- } to digits.
- } to thumb

NB: Origin, insertion, N/S & action discussed later.

ARTERIES OF FOREARM & HAND

RADIAL ARTERY

*Beginning :-

- The smaller terminal branch of brachial artery, at level of neck of radius (in cubital fossa).

*End :-

- Continues as deep palmar arch, at level of proximal end of fully extended thumb. (at base of 5th metacarpal bone).

*Branches :-

• In forearm: ① radial recurrent artery.

② Muscular branches.

③ Palmar (anterior) carpal artery:-

- Joins palmar carpal branch of ulnar artery to form the Palmar carpal arch

④ Superficial palmar branch:-

- Joins superficial palmar arch to complete the arch.

• In hand: ① Dorsal (Posterior) carpal artery:-
"dorsum"

- Joins dorsal (post) branch of ulnar artery to form the Dorsal carpal arch, which gives:-

- Dorsal digital artery for medial side of little finger.
- Second, third, & fourth metacarpal arteries that divide into two branches to supply adjacent sides of 2nd, 3rd, 4th & 5th fingers.

② First dorsal metacarpal artery:-

- Divides into two branches, supply adjacent sides of the 1st & 2nd fingers.

③ Dorsal digital artery:

- Supply the lateral side of thumb.

• In hand:
"Palm"

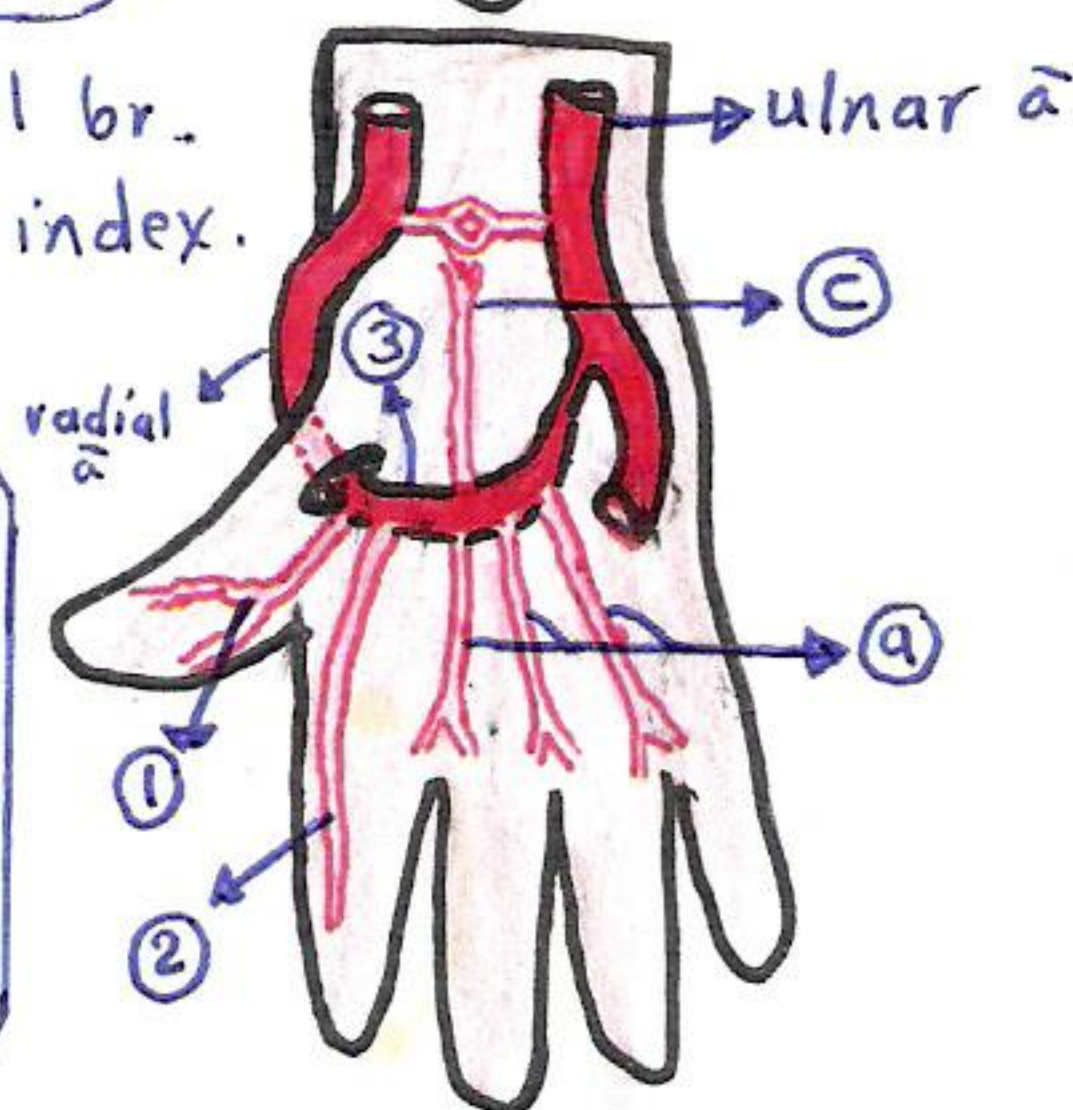
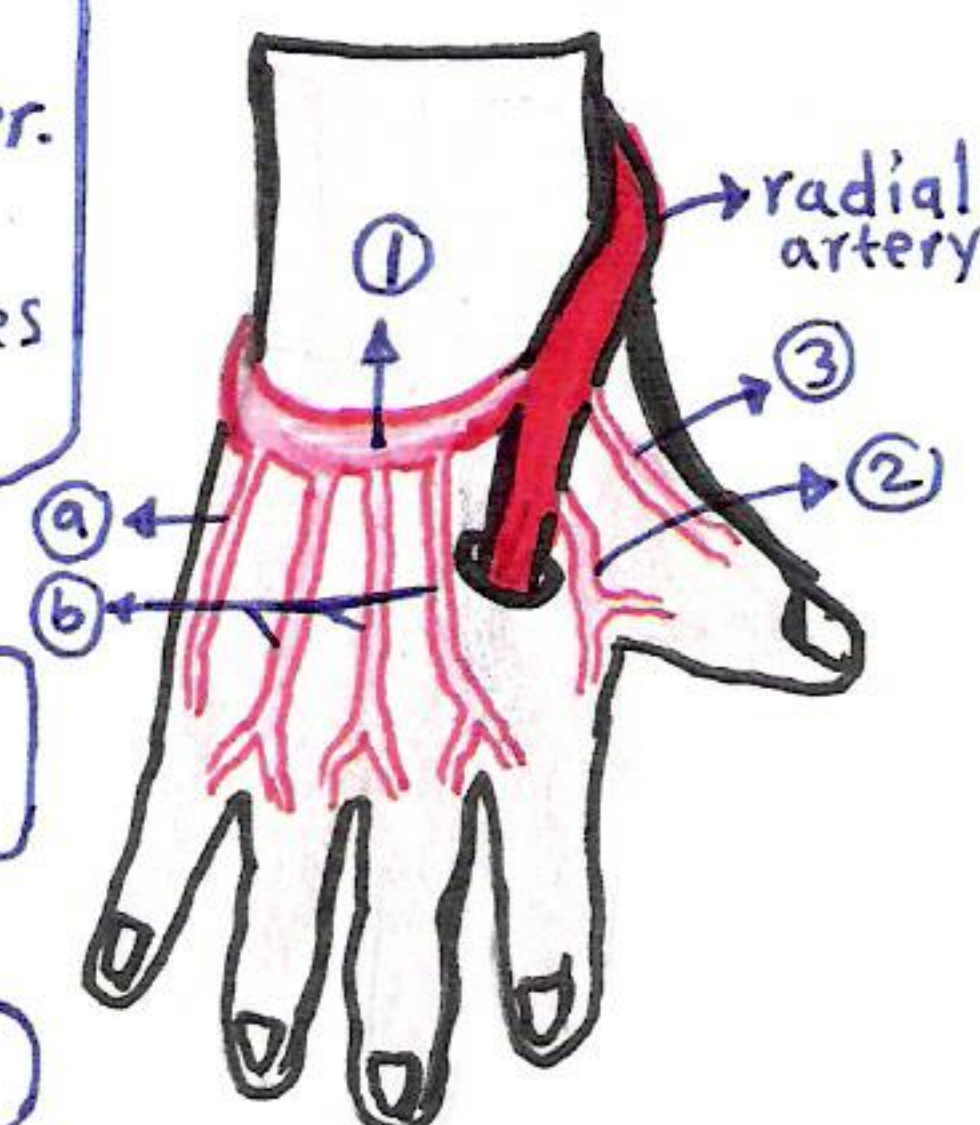
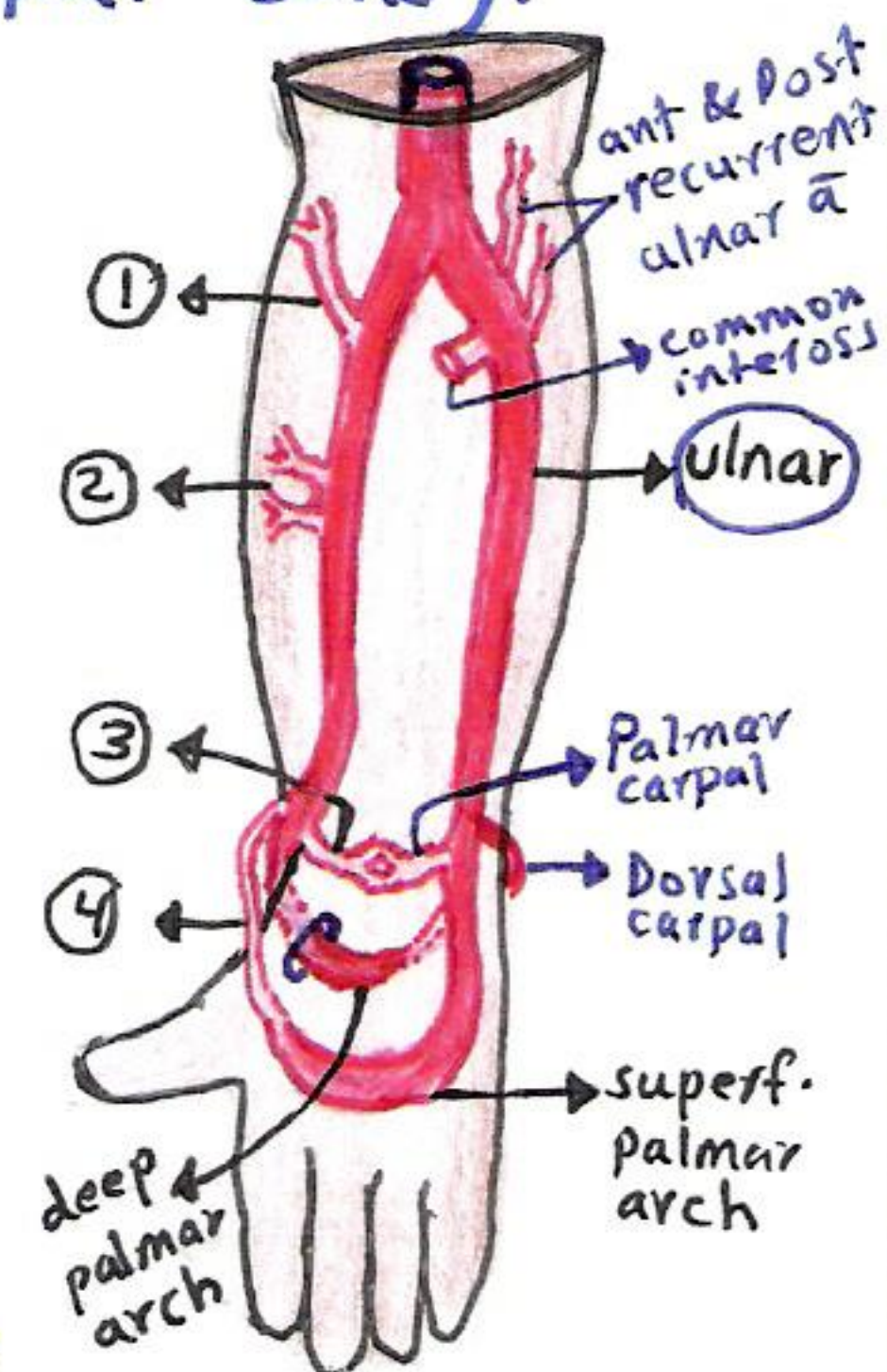
① Princeps pollicis artery: divide into 2 digital br.

② Radialis indicis artery. along lateral side of index.

③ Deep palmar arch:-

- Continuation of radial artery; giving:-

- three Palmar metacarpal arteries.
- three Perforating arteries: perforate dorsal interossei muscles to join 3 dorsal metacarpal a.
- Recurrent branch:- ascend to join the anterior carpal arch



* Course & relation of radial a :-

- Radial artery starts at neck of radius, descends in the forearm at lateral side (accompanied by ² venae comitantes).

• Anterior (superficial) relation :-

- upper 2/3 of forearm: covered only by brachioradialis.
- Lower 1/3 is subcutaneous & pulsations can be felt.

• Posterior (Deep) relation :-

- | | |
|---|----------------------------|
| 1- Tendon of biceps brachii. | 5- Flexor pollicis longus. |
| 2- Supinator | 6- Pronator quadratus |
| 3- Pronator teres | 7- radius (lower end) |
| 4- Flexor digitorum superficialis (radial head) | |

"To Swim Properly Flex Forearm, Pronate Radius."

• Lateral relation :-

- radial nerve & brachioradialis.

• Medial relation :-

- pronator teres & flexor carpi radialis.

- radial artery winds posteriorly (at distal end of radius) to reach anatomical snuffbox (passing deep to abductor pollicis longus and extensor pollicis brevis), — leaves the snuffbox deep to extensor pollicis longus reaching the first interosseous space.
- It enters the palm of the hand between 2 heads of the 1st dorsal interosseous & 2 heads of adductor pollicis and continues as deep palmar arch.

* Surface anatomy :-

1- Ulnar artery: by drawing 3 points

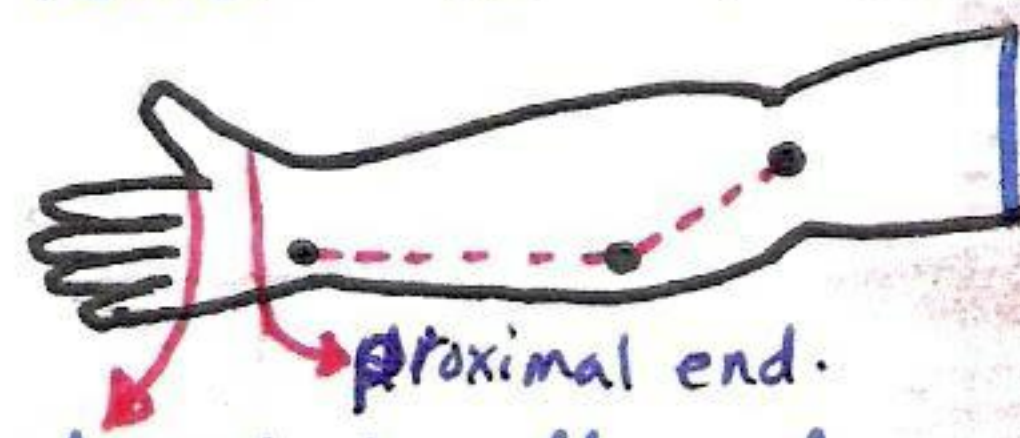
- Point at mid way between 2 epicondyles of humerus.
- Point at junction of upper 1/3 & lower 2/3 of the forearm at medial side.
- Point just lateral to Pisiform

2- superficial palmar arch:

- at distal border of fully extended thumb.

3- Deep palmar arch:

- at Proximal border of extended thumb.



ULNAR ARTERY

* Beginning :-

- The larger terminal branch of brachial a (opposite neck of radius).

* End :-

- Lateral to Pisiform by dividing into two terminal branches

① Superficial branch (continuation of ulnar a) forming superficial palmar arch [with superficial palmar branch of radial artery].

② Deep branch: joins end of radial artery forming deep palmar arch.

* Branches:- see Page (37)

- In forearm:
 - ① anterior & posterior ulnar recurrent arteries.
 - ② Common interosseous artery (described later).
 - ③ Muscular branches.
 - ④ Palmar Carpal artery (Joins that of radial a)
 - ⑤ Dorsal carpal artery (joins that of radial a).

- common interosseous artery:-

- arise from ulnar artery & divides into:-

① Anterior interosseous artery :- (AIA)

- AIA runs in front of interosseous membrane accompanied by ant. interosseous nerve (branch of median N.) and about two inches above the wrist it pierces the interosseous membrane to reach the back of forearm where it ends by joining the dorsal carpal arch.

- It gives
 - Median artery (accompanies median nerve).
 - Muscular & nutrient arteries. (to ulna, radius & m.r.)
 - descending branch (joins palmar carpal arch)

② Posterior interosseous artery :- (PIA)

- PIA is the smaller branch than AIA, runs behind inteross. membrane accompanied by post. inteross. nerve (deep br. of radial) and ends by anastomosing with AIA.

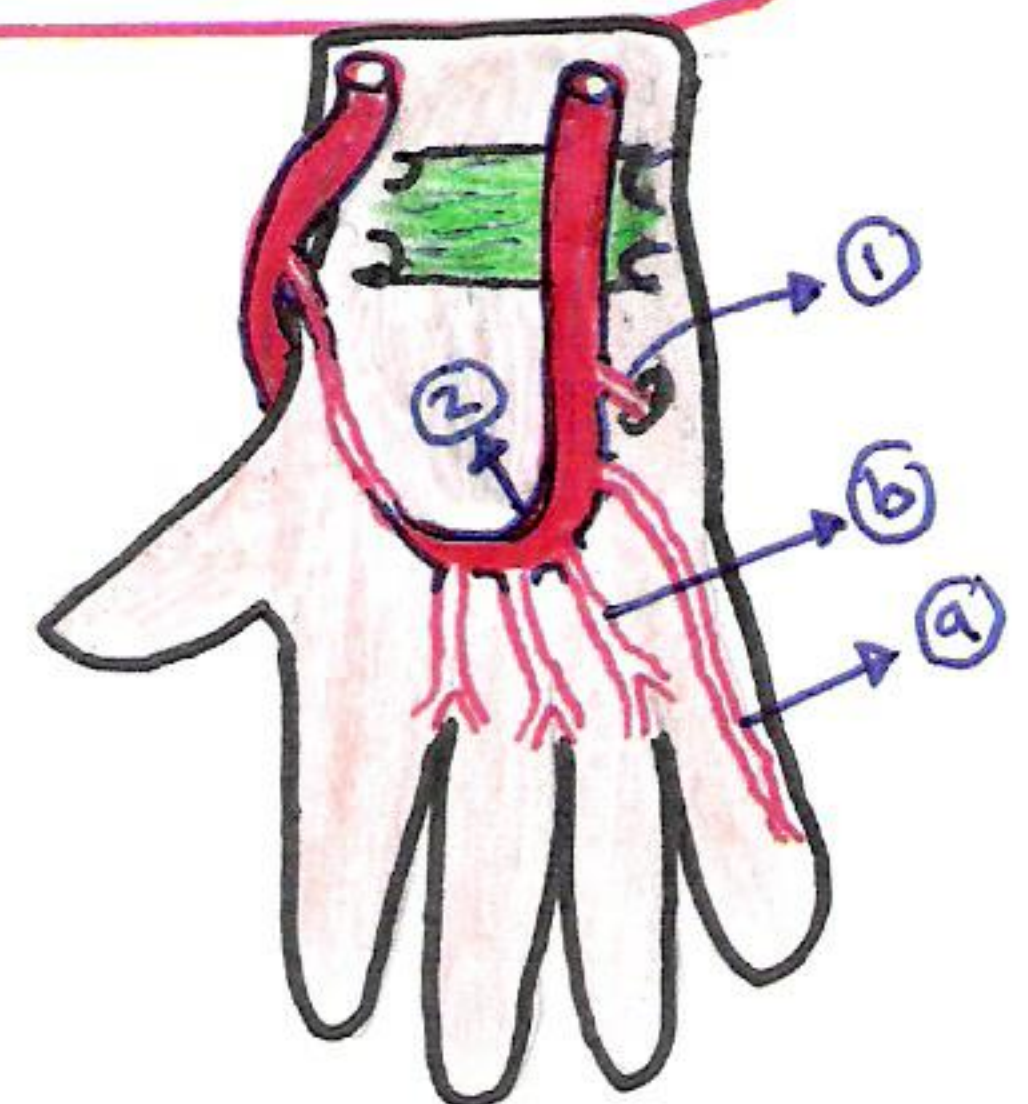
- It gives
 - interosseous recurrent artery. (elbow anastomosis)
 - Muscular branches.

- In hand:
 - ① Deep branch :- Joins end of radial artery to complete deep palmar arch.

② Superficial palmar arch:-

- continuation of ulnar artery giving:-

- a. Palmar digital a: to medial side of little finger
- b. three Palmar digital branches (three branches) to adjacent sides of 2nd, 3rd & 4th ~~middle~~ fingers



*Course & relation of ulnar ā :-

- The ulnar artery is a larger terminal branch of brachial ā.
- separated from median nerve by deep (ulnar) head of pronator teres.
- In upper 1/3 of forearm; Passes obliquely downwards & medially deep to [① Pronator teres ② FCR, ③ PL ④ FDS, ⑤ FCU] superficial to [FDP]
- In lower 2/3 of forearm; Descends vertically deep to [FCU] and superficial to [FDP], lateral to [ulnar nerve].
- Enters the hand superficial to Flexor retinaculum just lateral to Pisiform and hook of hamate [with ulnar nerve between the artery & bones].
 → Here the ulnar artery and nerve lie in a fibro-osseous tunnel called The tunnel of Guyon.
- Ends by becoming superf. palmar arch.

*Applied anatomy of radial ā :-

- The radial pulse is the most commonly used one for feeling and counting the arterial pulsation.
- Pulsation felt against distal end of radius close to lateral side of FCR tendon.

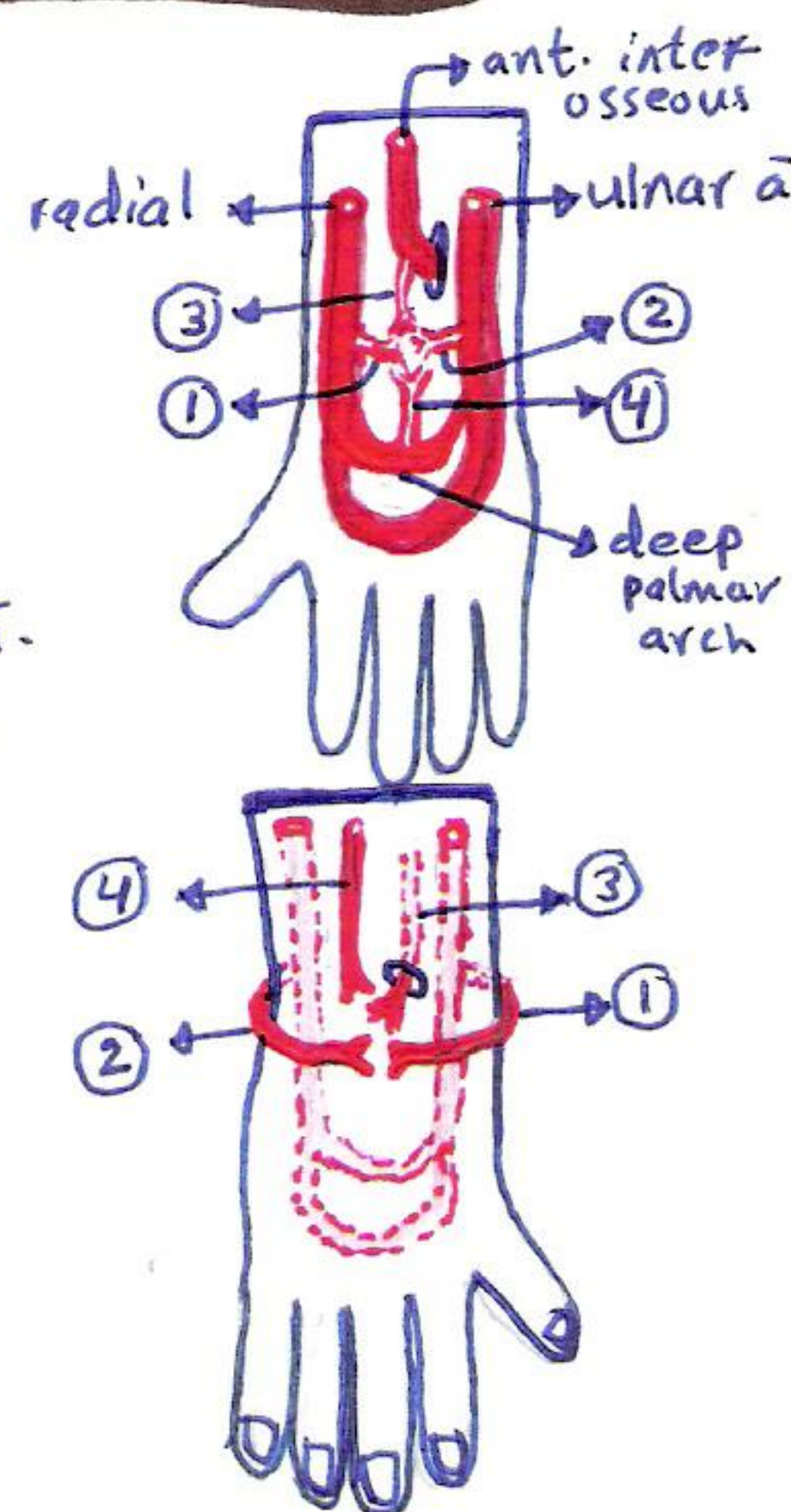
*ANASTOMOSIS AROUND WRIST :-

(A) Front of wrist (anterior carpal arch):

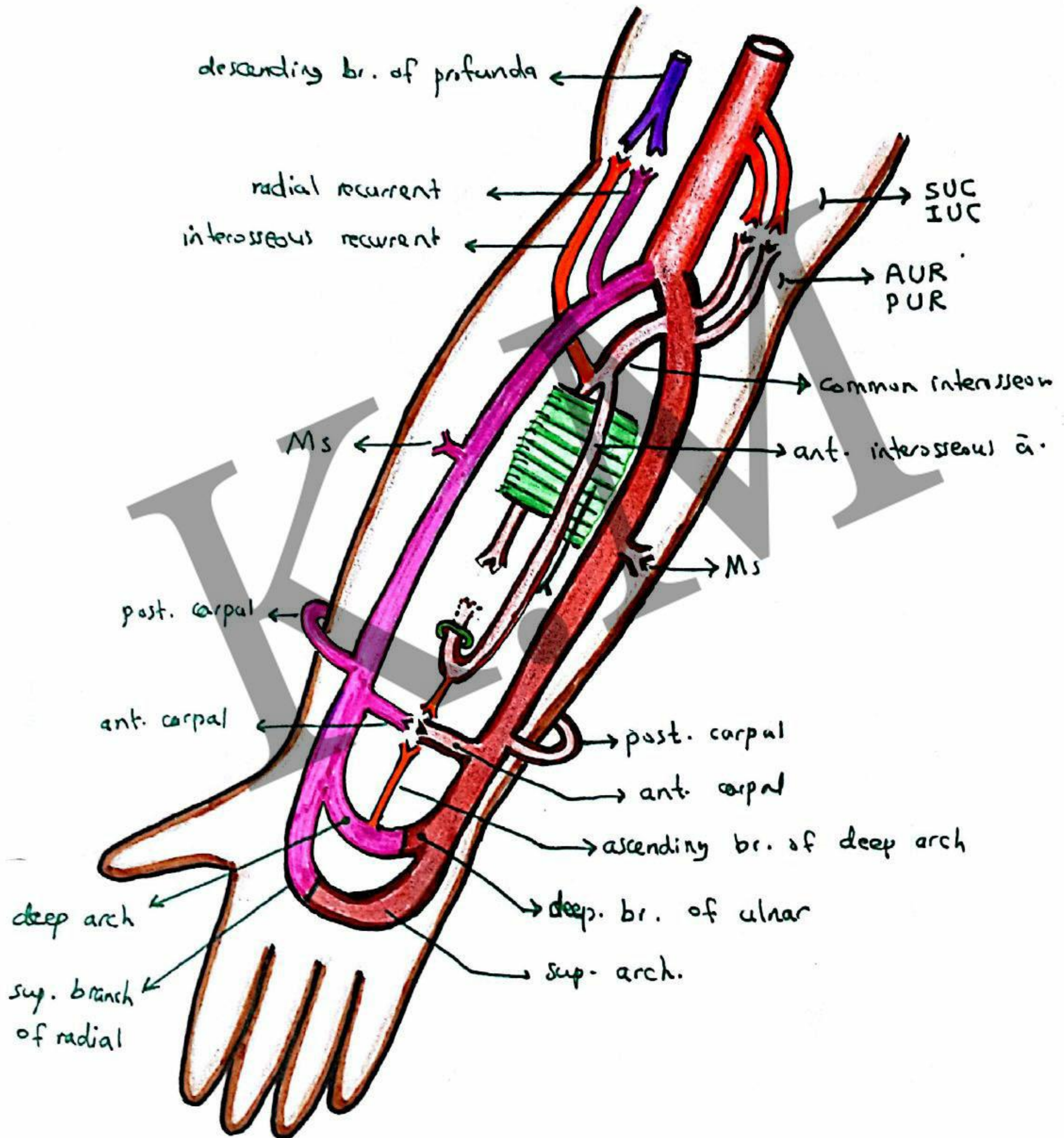
- 1- Anterior carpal branch of radial artery.
- 2- Anterior carpal branch of ulnar artery.
- 3- Descending (carpal) branch of anterior interosseous ā.
- 4- Ascending (recurrent) branch of deep palmar arch.

(B) Behind the wrist (posterior carpal arch):

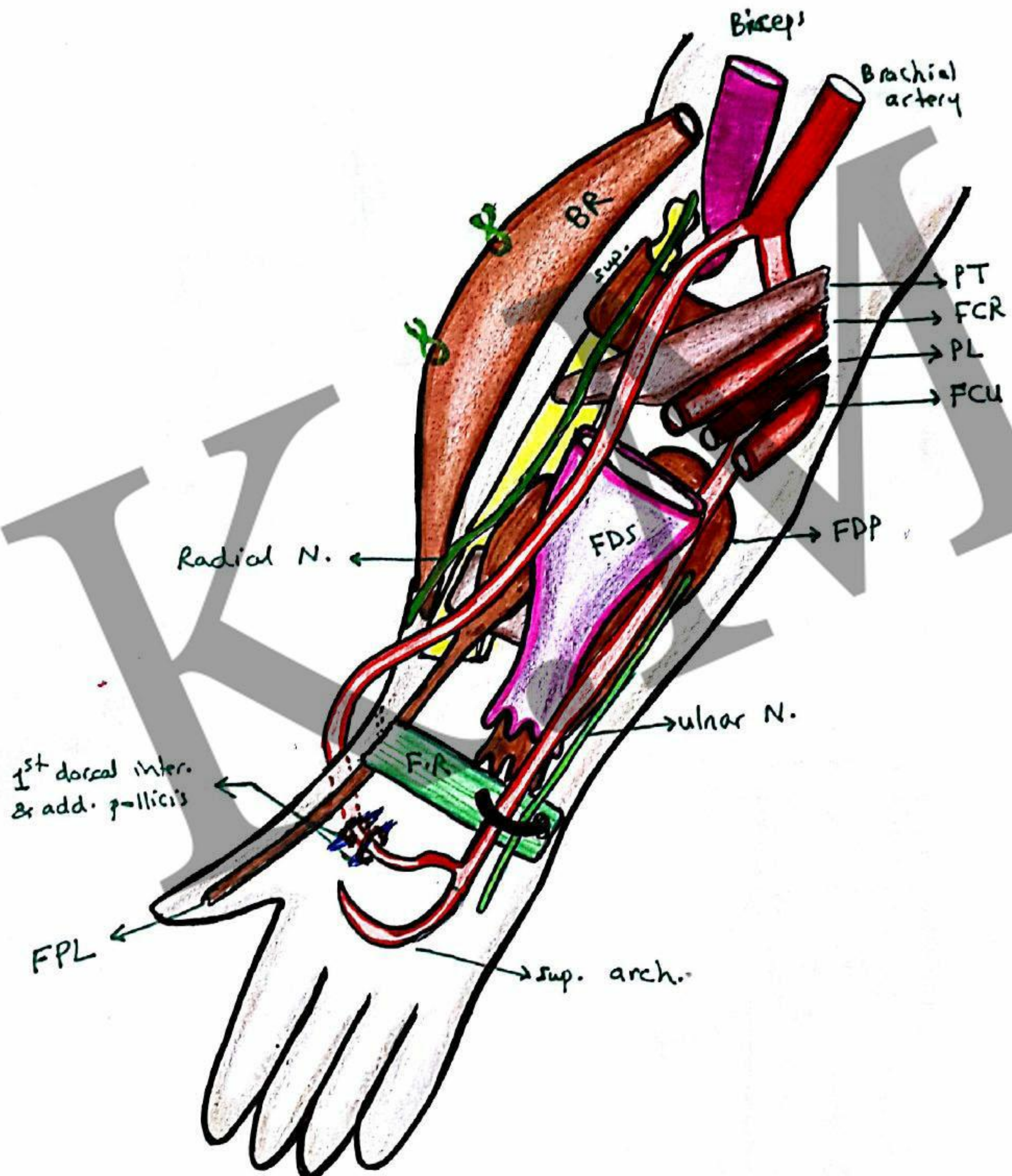
- 1- Posterior carpal branch of radial artery.
- 2- Posterior carpal branch of ulnar artery.
- 3- End of anterior interosseous artery (ulnar).
- 4- End of posterior interosseous artery (ulnar).

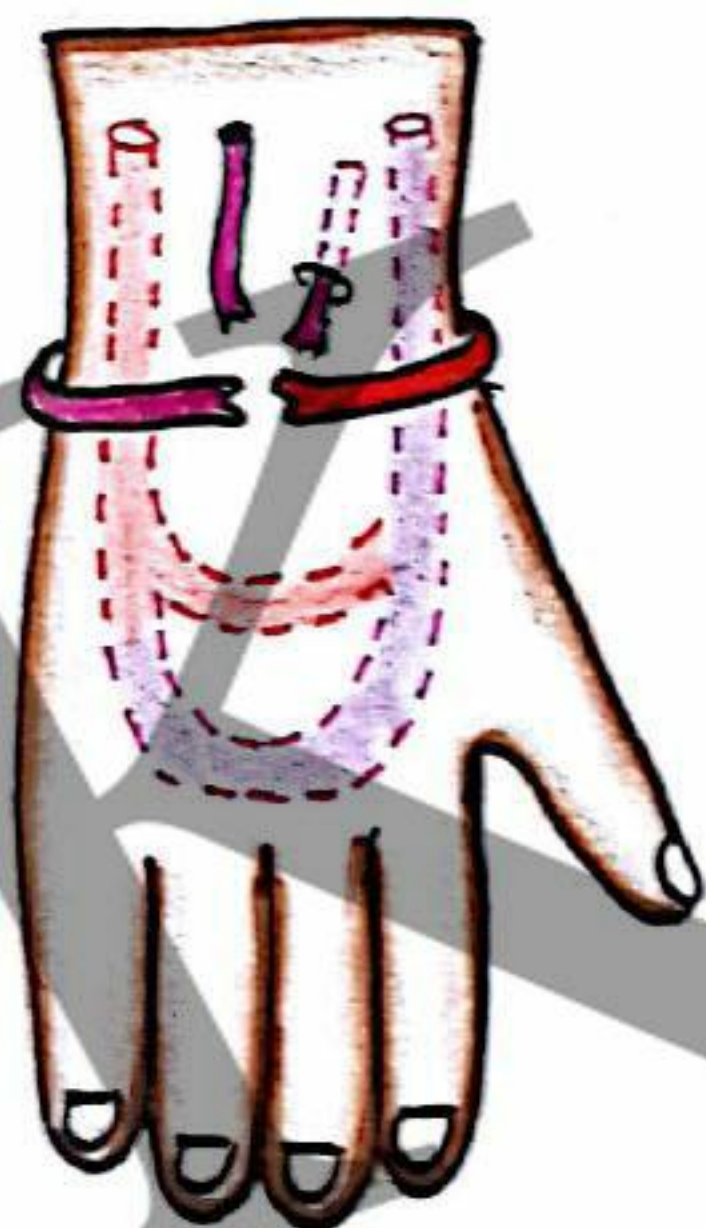
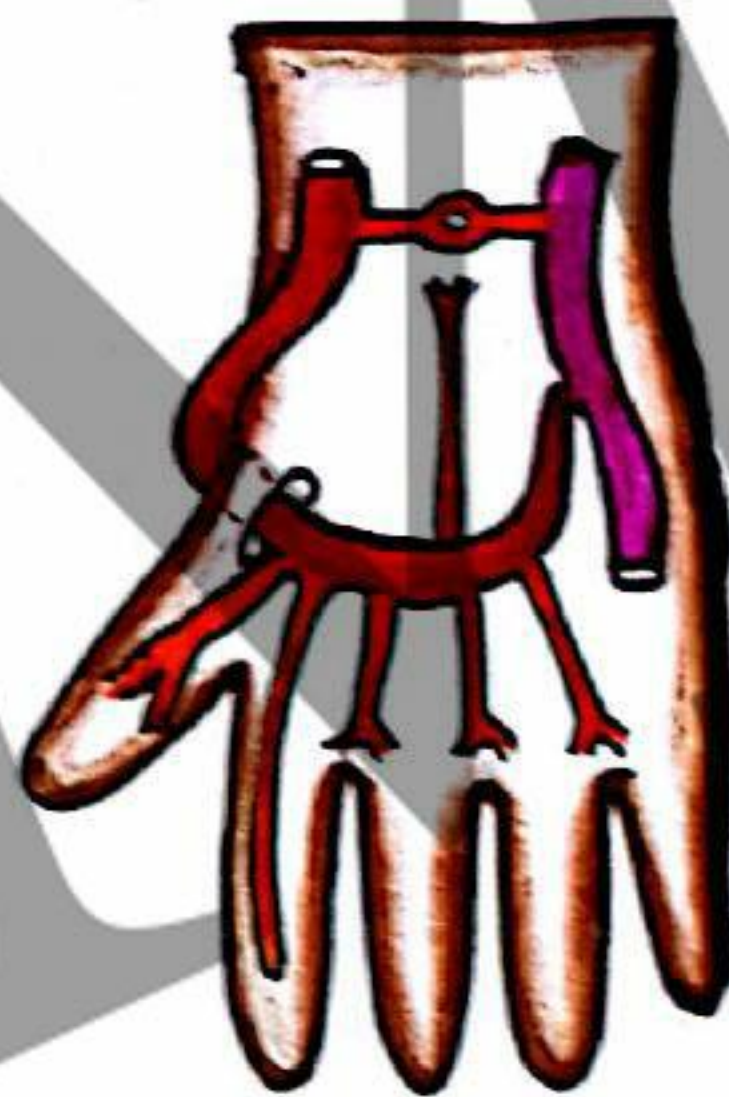
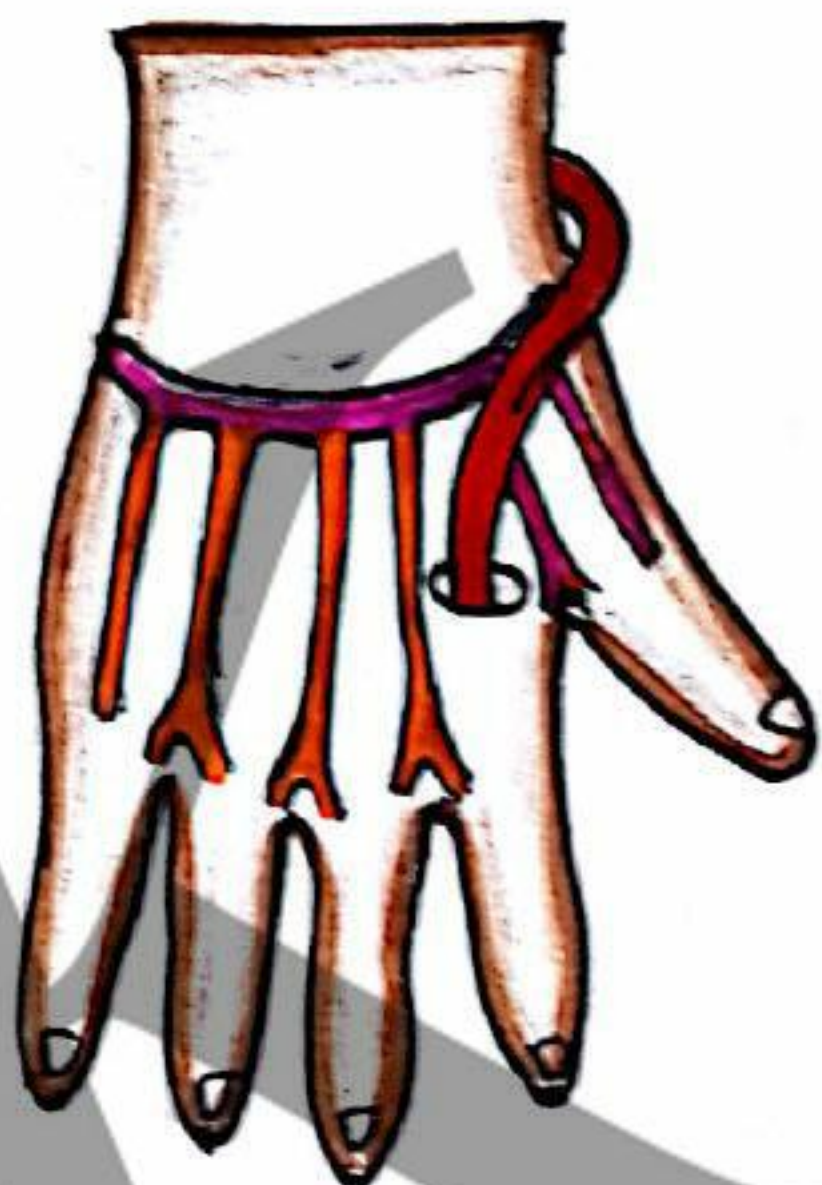


Ulnar & radial arteries (Branches)



Ulnar & radial artery (Relation).





EXTENSOR RETINACULUM

* Definition :-

- Oblique thickened band of deep fascia, on the back of the wrist, one inch wide. [sends septa dividing space under it into 6 compartments.]

* Attachment :-

- Medially attached to Pisiform & Triquetral bones. [P.T] Pisiform
Triquetral
- Laterally to lower end of radius (anterior border).

* Superficial relation :- see page (43)

- 1- Ulnar nerve (dorsal cutan. branch).
- 2- Radial nerve (superficial branch).
- 3- Cephalic vein.
- 4- Basilic vein.

* Deep relation :- [structures ^{deep} under it]

① 1st compartment :- (Lies on lateral surface of lower end of radius).

- Abductor pollicis longus (Ab.P.L).
- Extensor pollicis brevis (EPB).

② 2nd compartment :- (Lies lateral to dorsal tubercle of radius "in a groove")

- Extensor carpi radialis longus (ECR.L).
- Extensor " " brevis (ECR.B).

③ 3rd Compartment :- (lies medial to dorsal tubercle of radius).

- Extensor pollicis longus (EPL).

④ 4th Compartment :- (lies on posterior surface of radius).

- Extensor digitorum (ED).
- Extensor indicis (EI).

⑤ 5th compartment :- (between radius & ulna "radioulnar joint").

- Extensor digiti minimi (EDM).

⑥ 6th Compartment :- (between head of ulna & its styloid process).

- Extensor carpi ulnaris (ECU).

- • Termination of anterior interosseous artery
• Termination of posterior interosseous nerve

FLEXOR RETINACULUM

Definition :-

* Definition :-

- Thickened band of deep fascia in front of wrist (carpus) converting its concavity into a tunnel "carpal tunnel".

* Attachment :- see page (43)

- Medially to Pisiform & hook of Hamate. [P.H]
- Laterally to Scaphoid tubercle & Trapezium tubercle [S.T]

* Superficial relation :- "from medial to lateral".

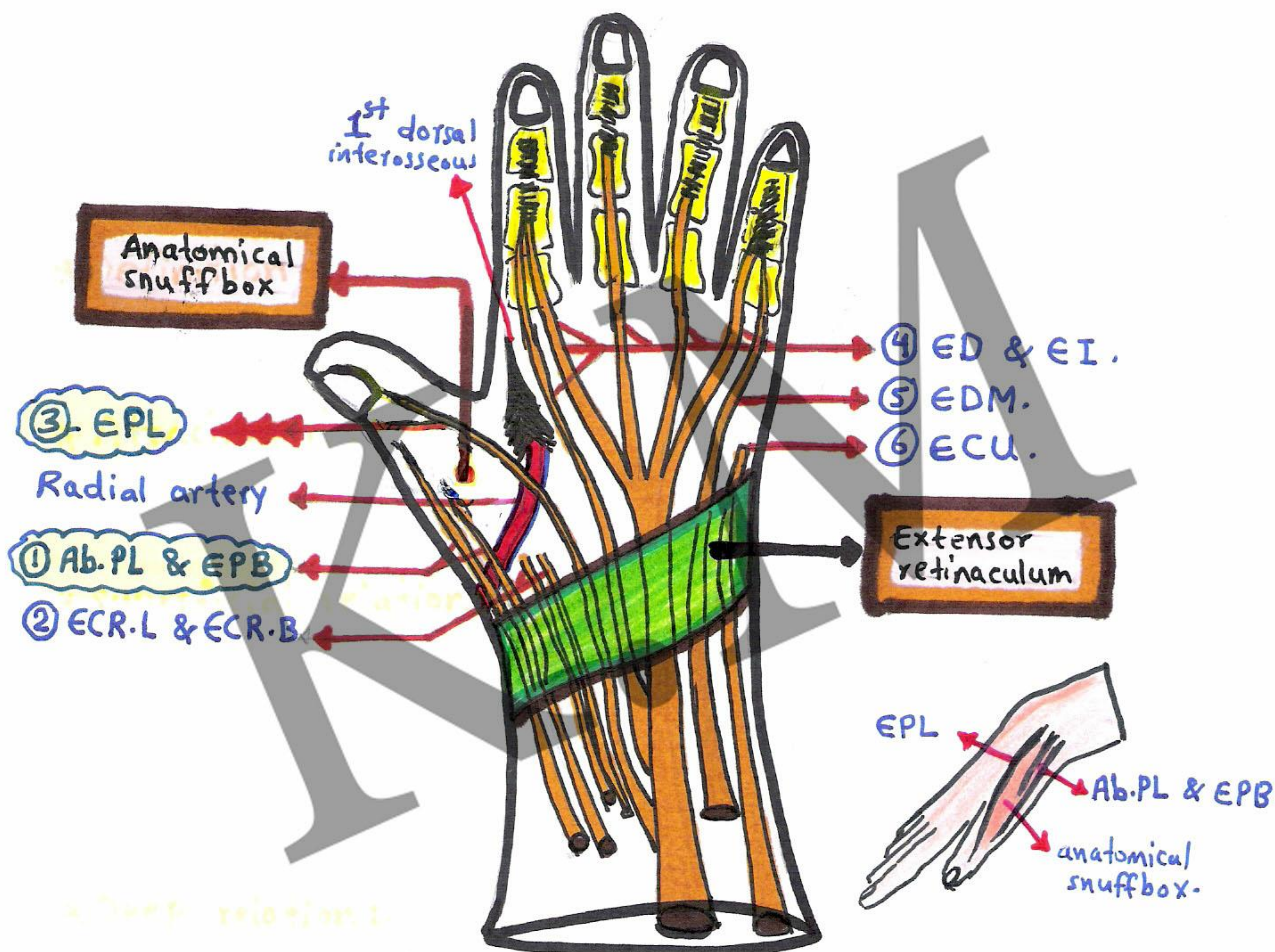
- 1- Ulnar nerve.
- 2- Ulnar artery.
- 3- Palmar cut. branch of ulnar nerve.
- 4- Palmaris longus tendon.
- 5- Palmar cut. branch of median nerve.

* Deep relation :- "inside carpal tunnel"

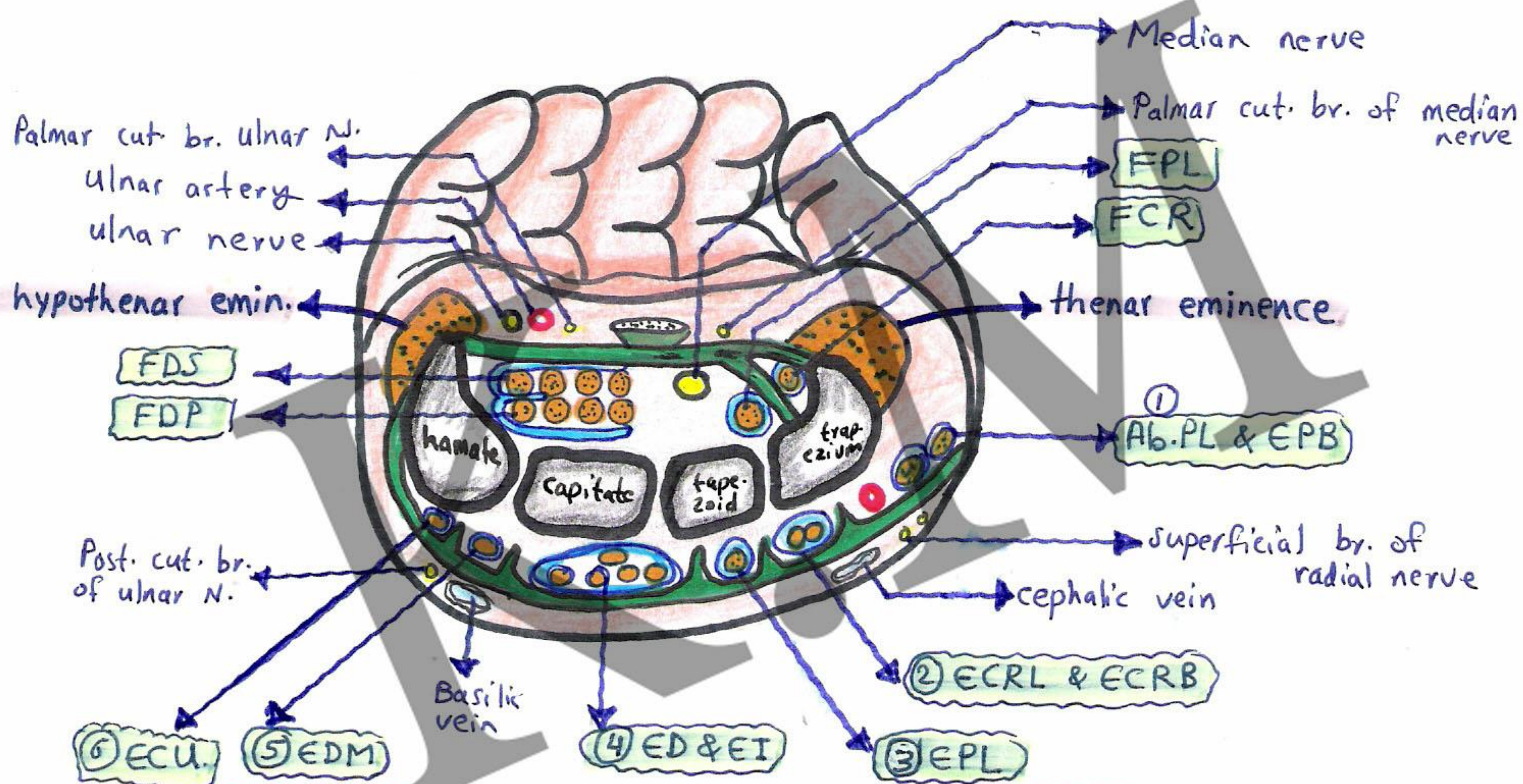
- 1- Flexor digitorum superficialis tendons (FDS).
- 2- Flexor digitorum profundus tendons (FDP).
- 3- Flexor Pollicis longus tendon (FPL).
- 4- Median nerve.
- 5- synovial sheath covering the long tendons.

Carpal tunnel syndrome :-

- It is a compression of median nerve inside the carpal tunnel (which is the space between convexity of flexor retinaculum & concavity of carpal bones)
- Caused by oedema or fracture of carpal bones and dislocation of wrist
- Can cause median nerve palsy.



Extensor retinaculum & snuffbox.



FLexor & Extensor retinacula.

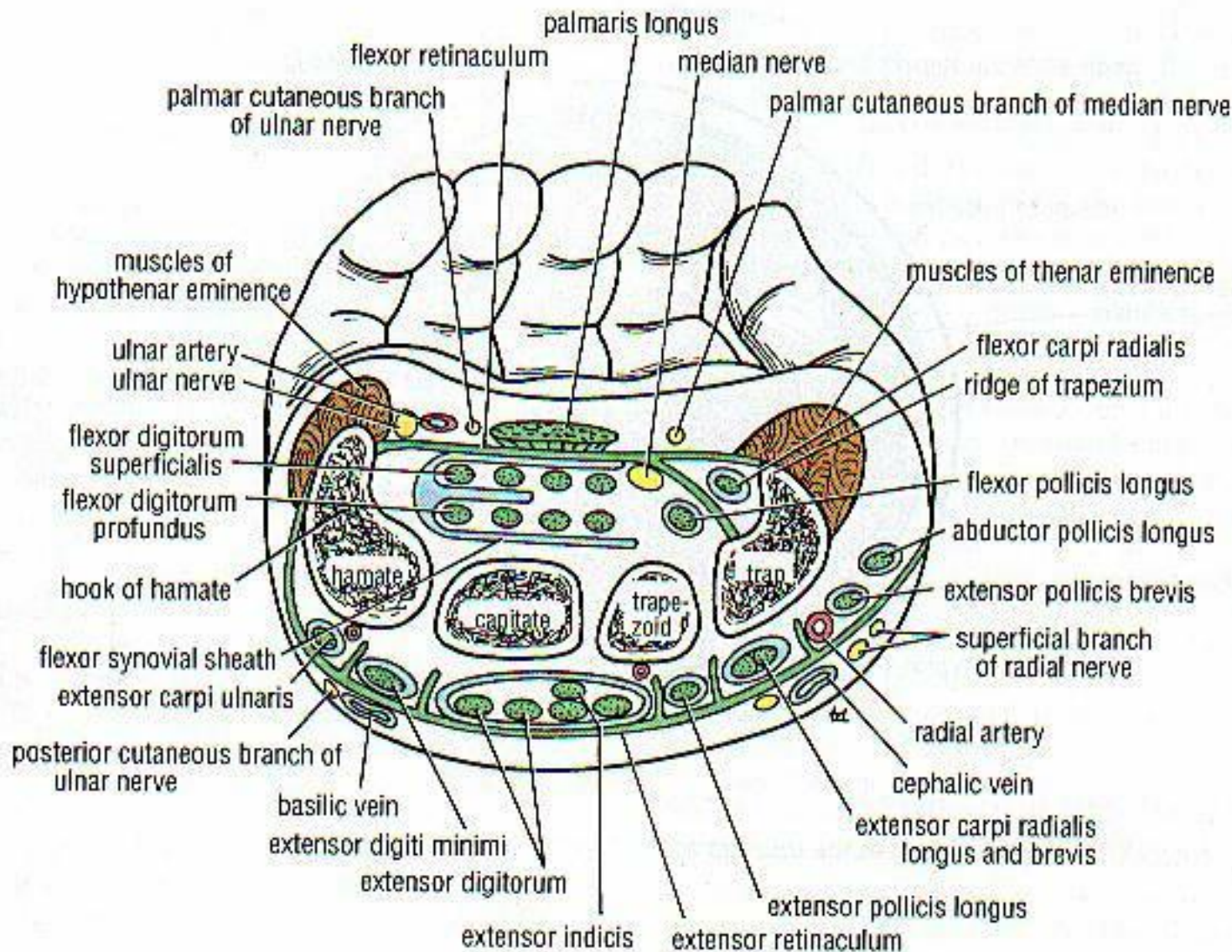


Figure 9-53 Cross section of the hand showing the relation of the tendons, nerves, and arteries to the flexor and extensor retinacula.

ANATOMICAL SNUFFBOX

* Definition:-

Depression at base of dorsal surface of thumb.

* Boundaries:- see page (43)

- Medial:- Extensor Pollicis Longus tendon (EPL).
- Lateral:- Ext. Pollicis brevis & Abductor Pollicis longus tendons. (EPB & Ab.PL)
- Roof:- skin & fascia with cephalic vein (and digital branches of radial nerve).
- Floor:- Scaphoid & Lunate (S.L.) (and styloid process of radius).
- Contents:- Radial artery.

* Clinical importance of snuffbox:-

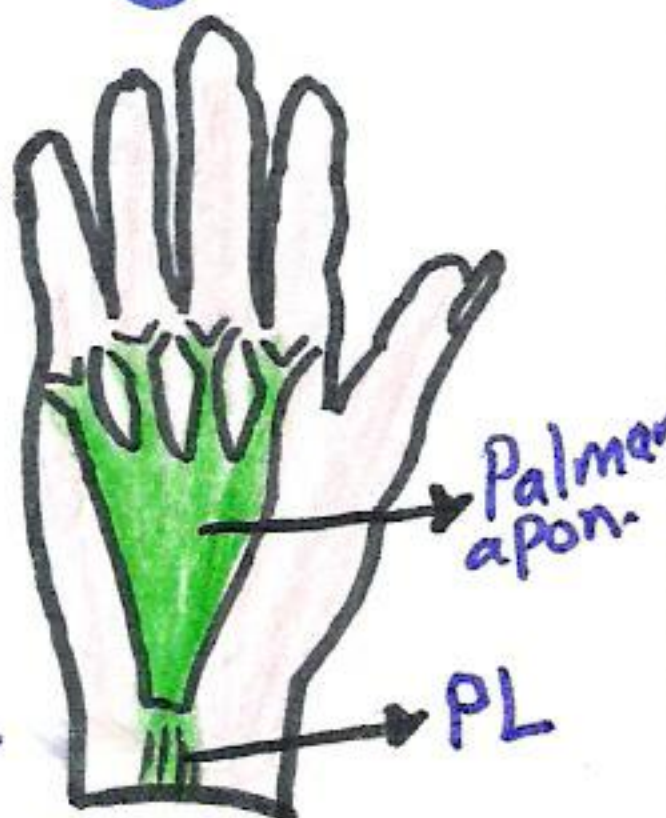
- ① Pulsation of radial artery.
- ② Tenderness at snuffbox may indicate a vascular necrosis of scaphoid bone.

PALMAR APONEUROSIS

- Triangular thickened deep fascia. (apex directed proximally).
- Apex continuous with Palmaris longus tendon & flexor retinaculum.
- Base divided into 4 slips to medial 4 fingers, each slip attached to skin of palm & fibrous flexor sheath of long flexor tendons at finger roots.
- It sends medial & lateral ^{Palmar} septa attaching to 5th & 1st metacarpal bones respectively.

* Structures deep to Palmar aponeurosis are:-

- ① Superficial & deep palmar arches.
- ② tendons of FDS and FDP.
- ③ Lumbrical muscles
- ④ Deep branch of ulnar nerve.
- ⑤ Digital branches of median nerve.
- ⑥ common Palmar digital branches.



FASCIAL SPACES OF HAND

- The Palm of hand is divided into 3 compartments:

- ① Lateral compartment:- containing thenar muscles.
- ② Medial compartment:- containing hypothenar ms.
- ③ Intermediate compartment:- between the two, it is divided by intermediate palmar septum into:-

A:- Midpalmar space:-

• Boundaries:-

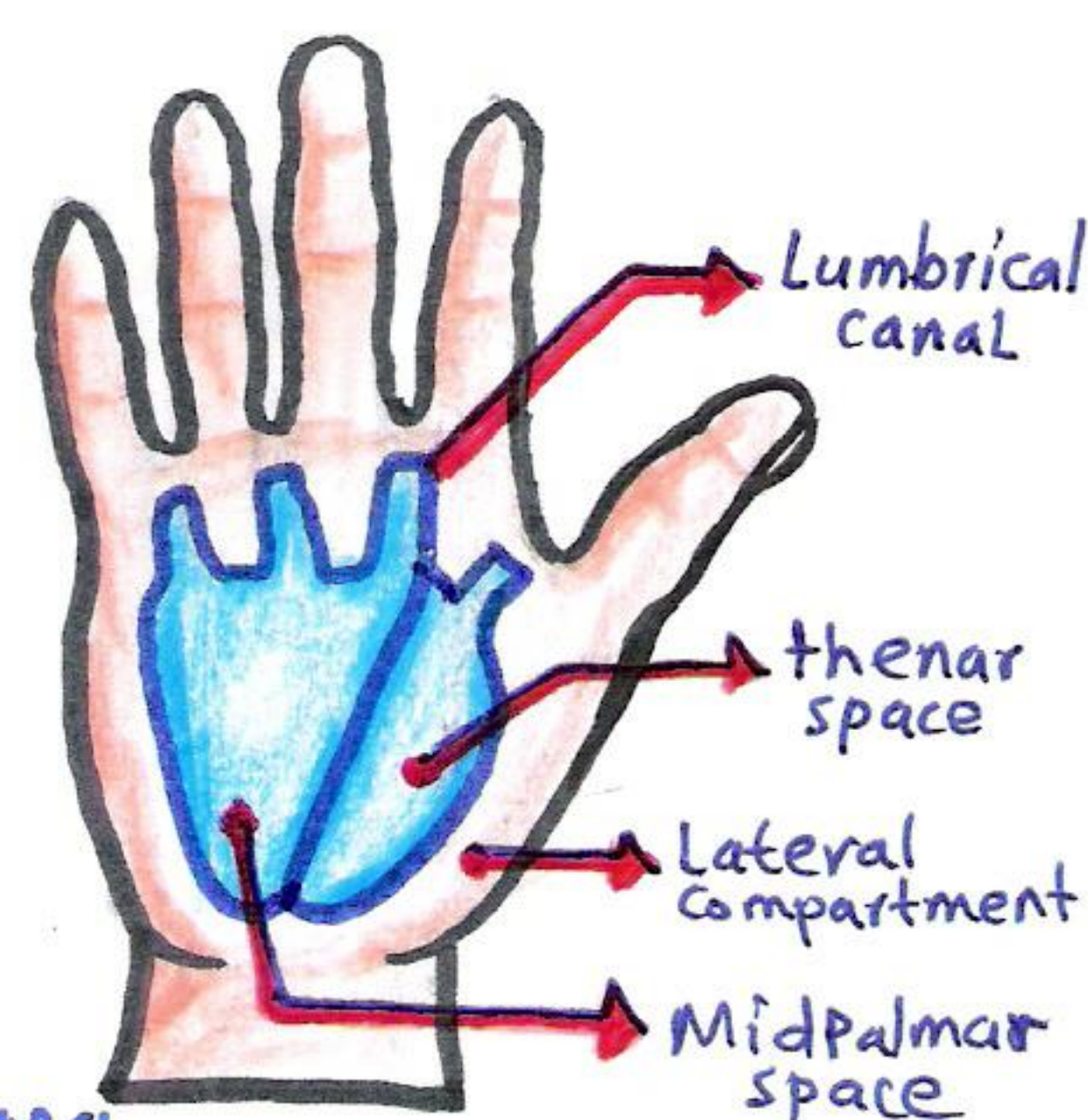
- Laterally: intermediate palmar septum.
- Medially: Medial palmar septum.
- Ventrally: Palmar aponeurosis.
- Dorsally: 3rd, 4th, 5th metacarpal bones.

• Contents:-

- Tendons to 3rd, 4th, 5th fingers (of FDS, FDP).
- the 2nd, 3rd, 4th Lumbrical muscles.
- superficial palmar arch.
- Palmar digital nerves & vessels to medial 3 fingers

• Communication:-

- Distally: to webs between medial 4 fingers
- Proximally: with carpal tunnel.



B:- Thenar space:-

• Boundaries:-

- laterally:- Lateral Palmar septum.
- Medially:- intermediate palmar septum.
- Ventrally: Palmar aponeurosis.
- Dorsally: adductor pollicis (transverse head).

• Contents.

- Tendons to 1st, 2nd fingers (of FDS, FDP).
- the 1st Lumbricals.
- Palmar digital nerves & vessels to 1st & 2nd fingers.

• Communication:-

- Distally: to web between 1st & 2nd fingers.
- Proximally: with carpal tunnel.

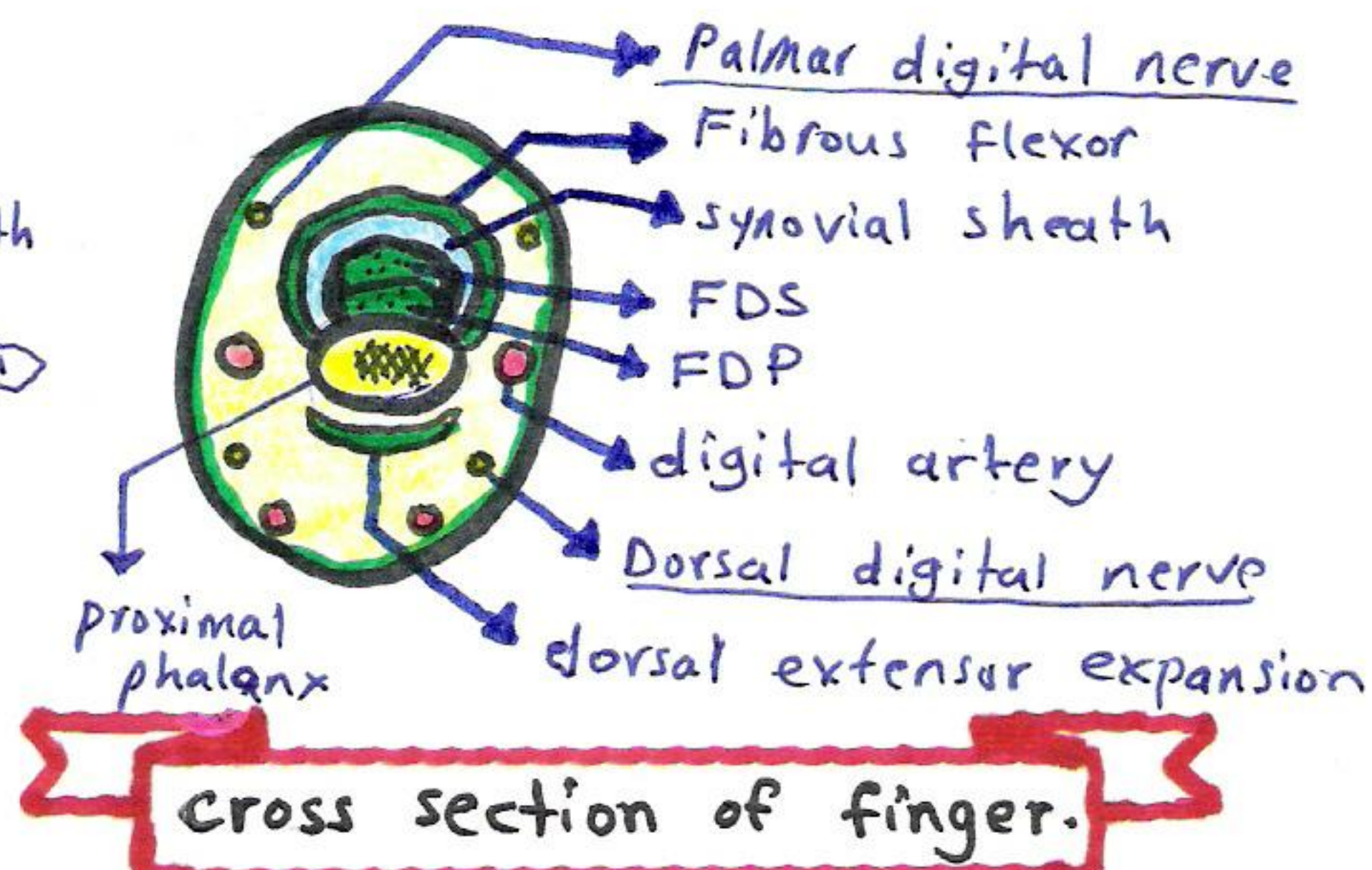
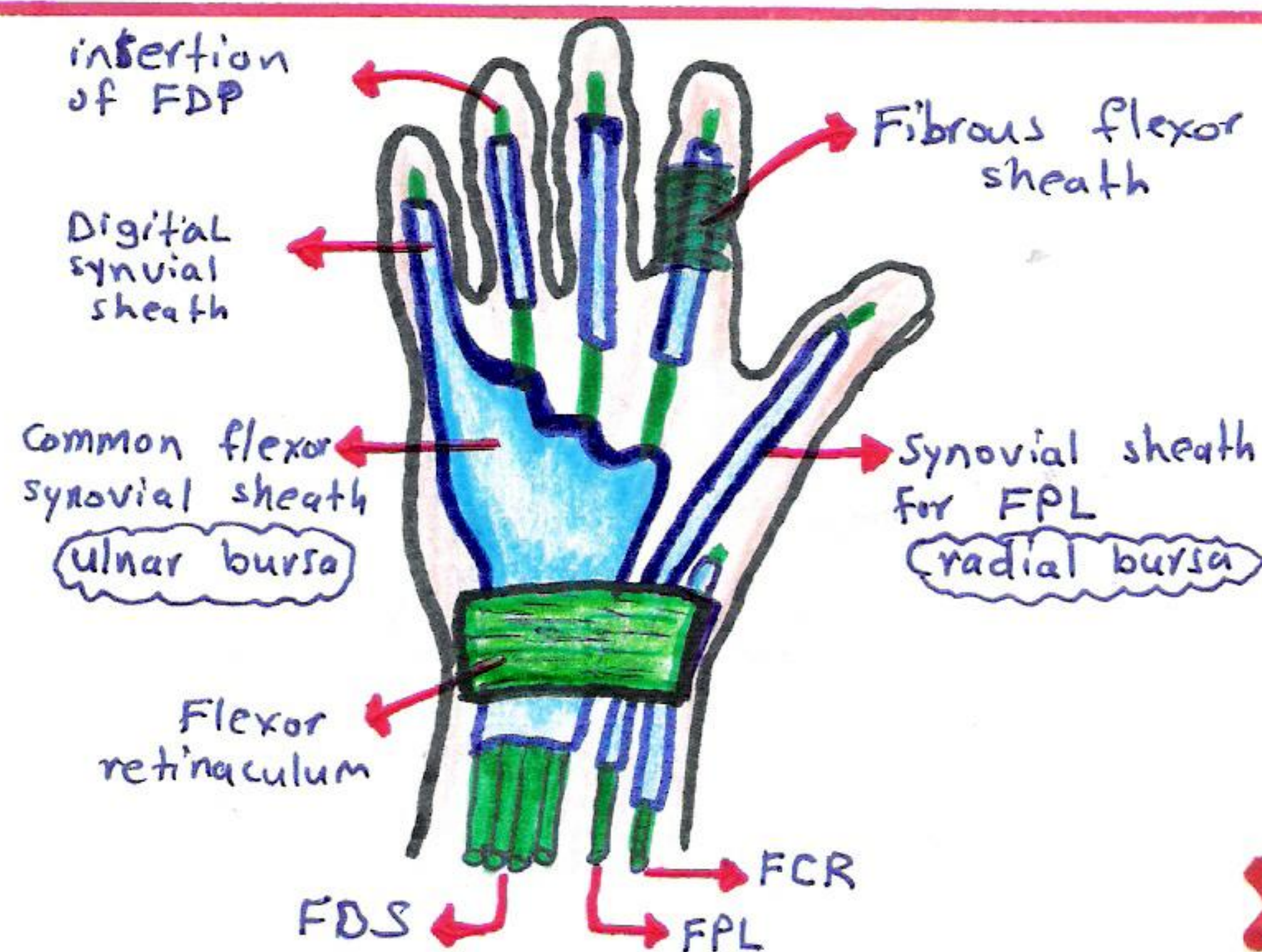
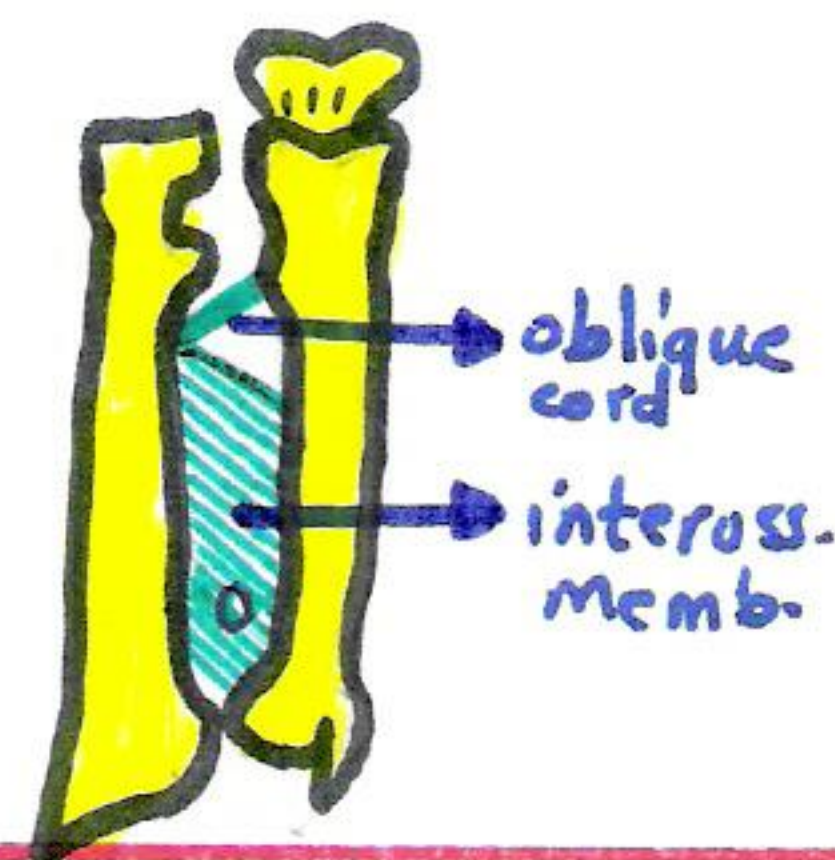
N.B. Lumbrical canal: is the space surrounding each Lumbrical ms.

*NB:- Fibrous flexor sheaths:-

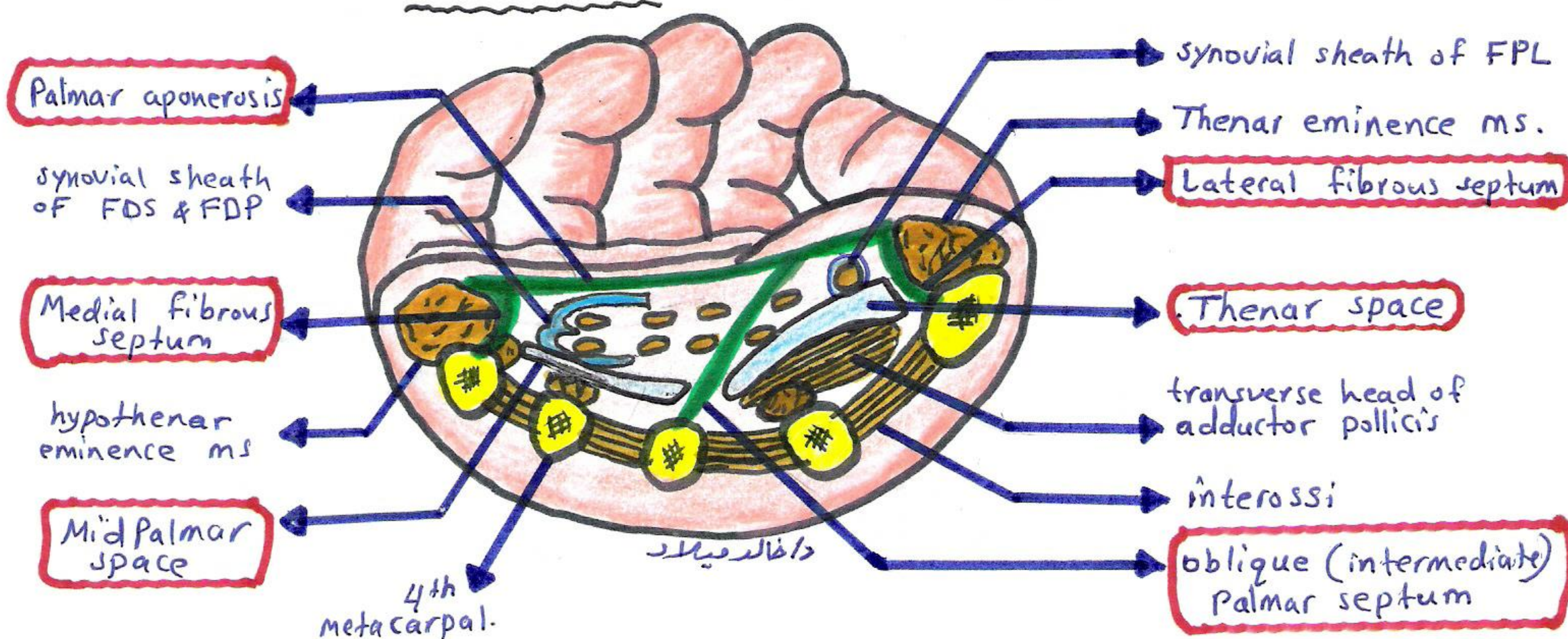
- Are sheaths of deep fascia that surround long flexor tendons (of FDS & FDP) inside digits.
- With bones of phalanges form tunnels (osteo-fascial canals) for the tendons that are lined by synovial sheaths.

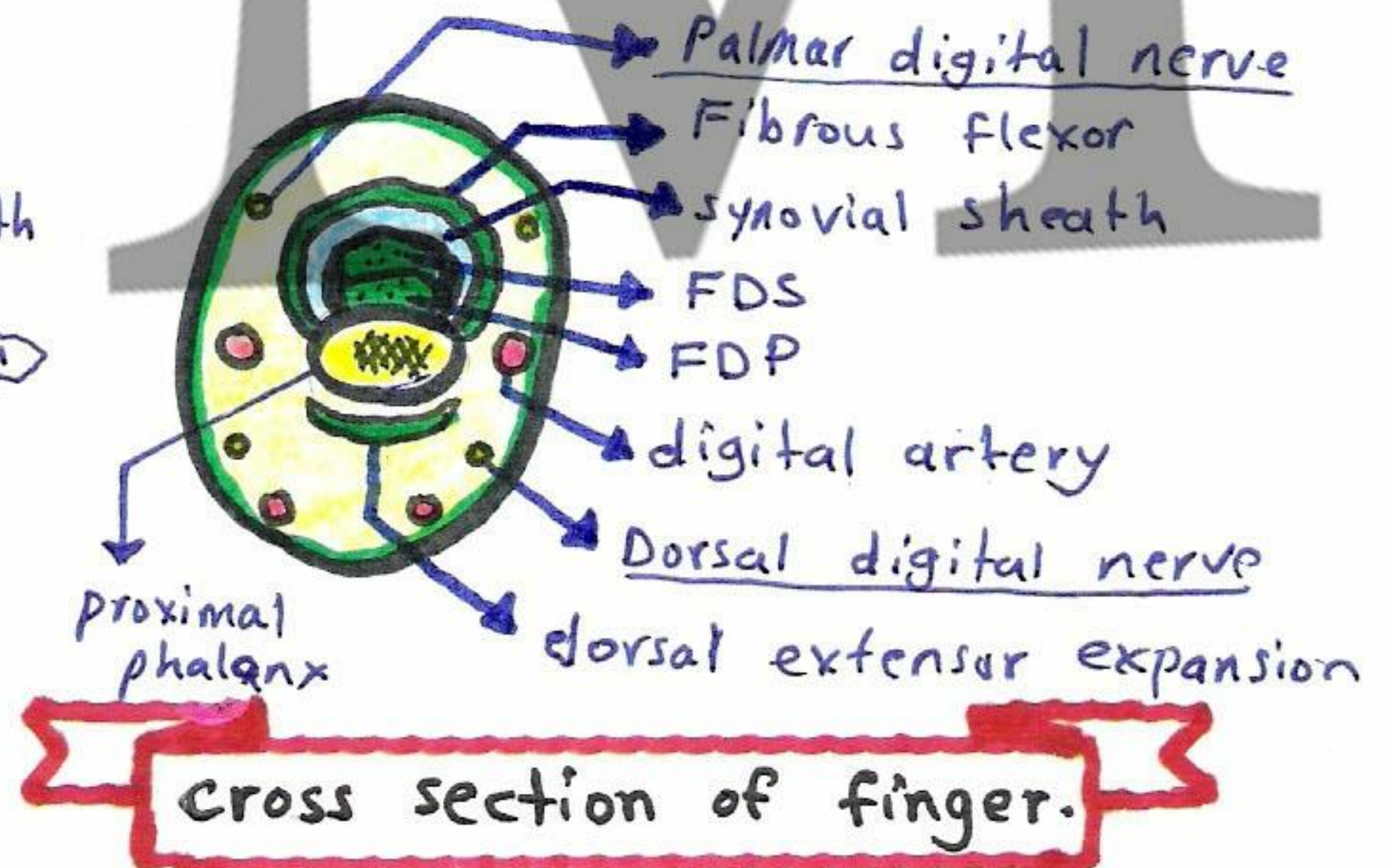
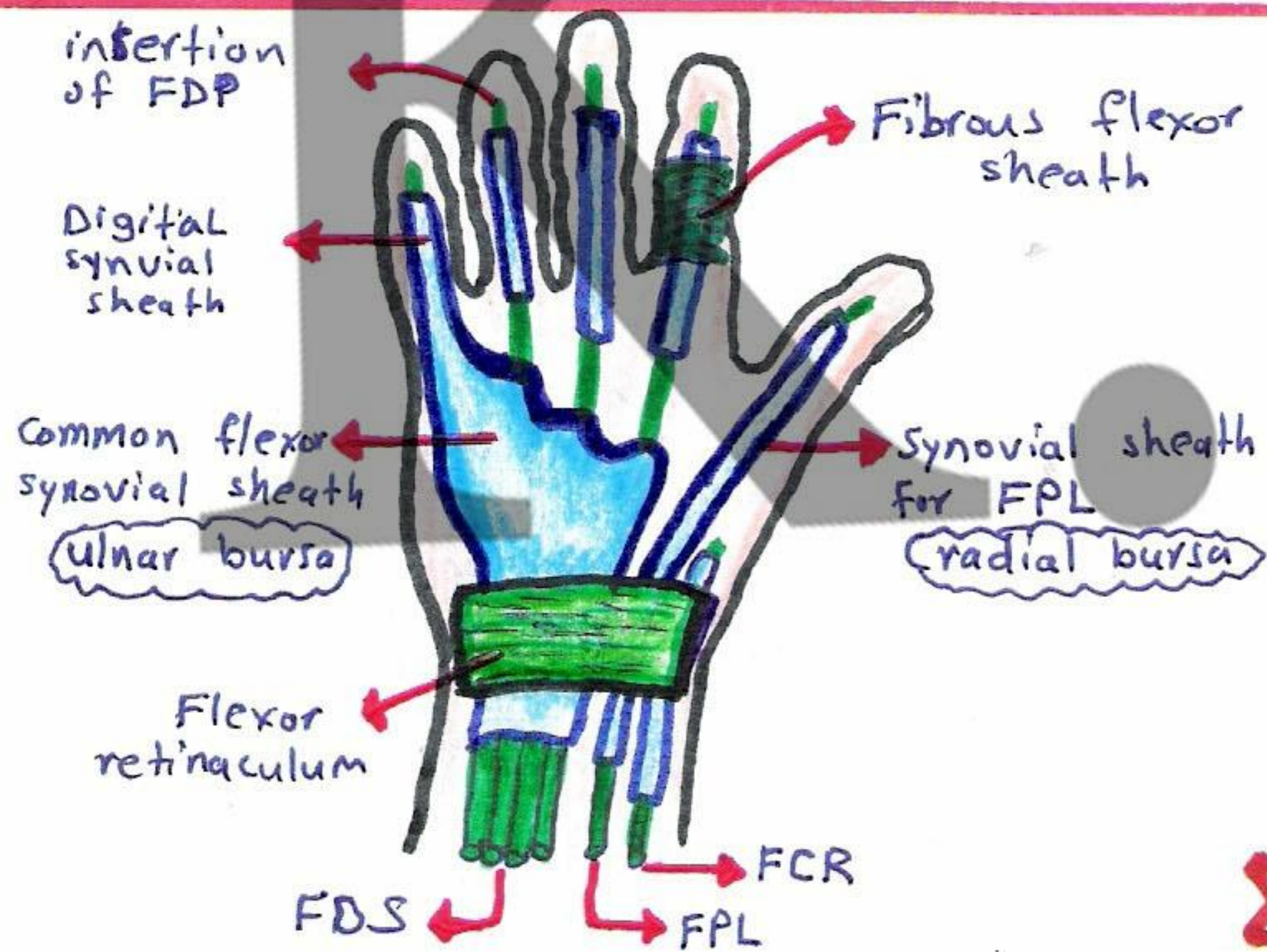
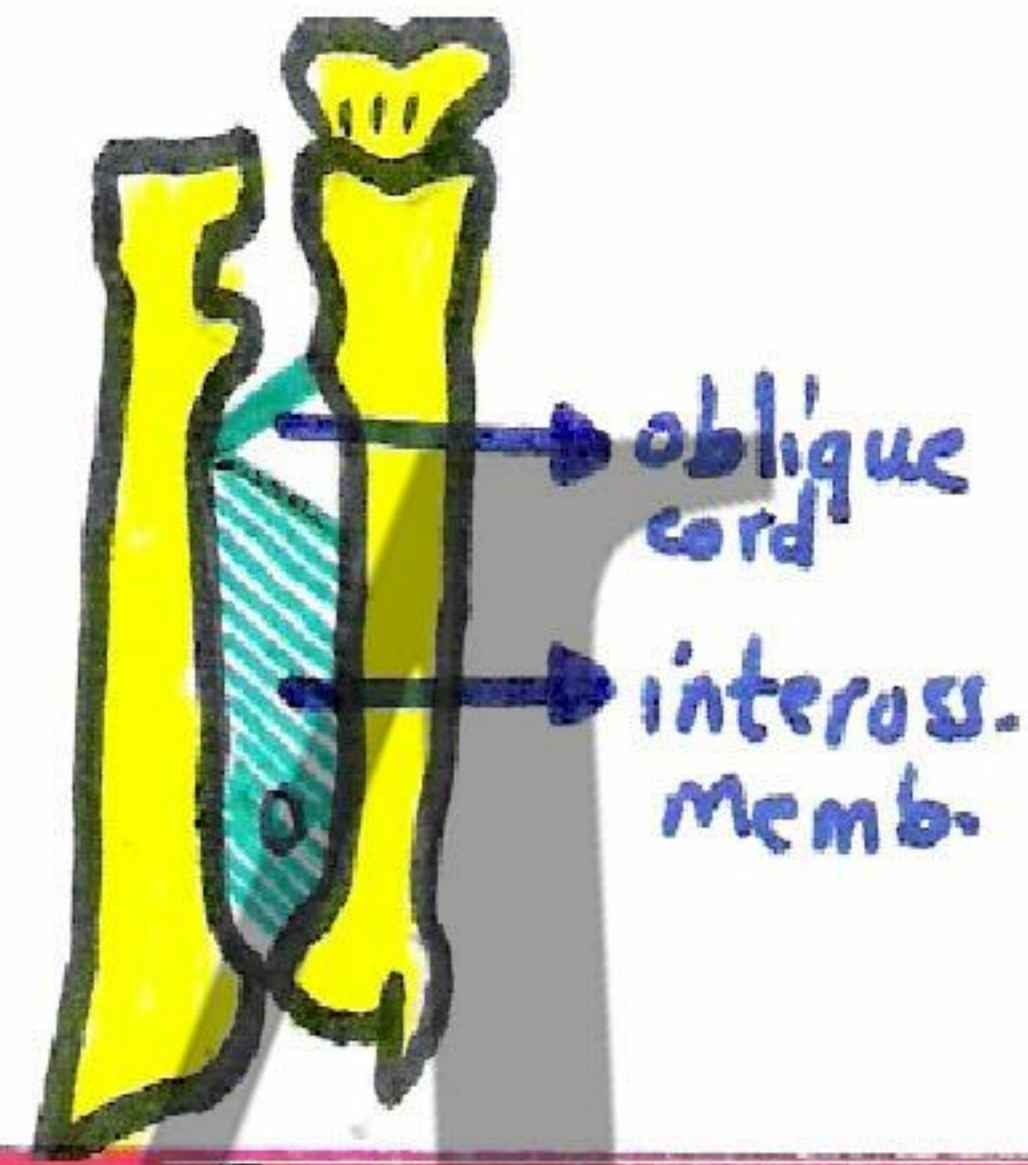
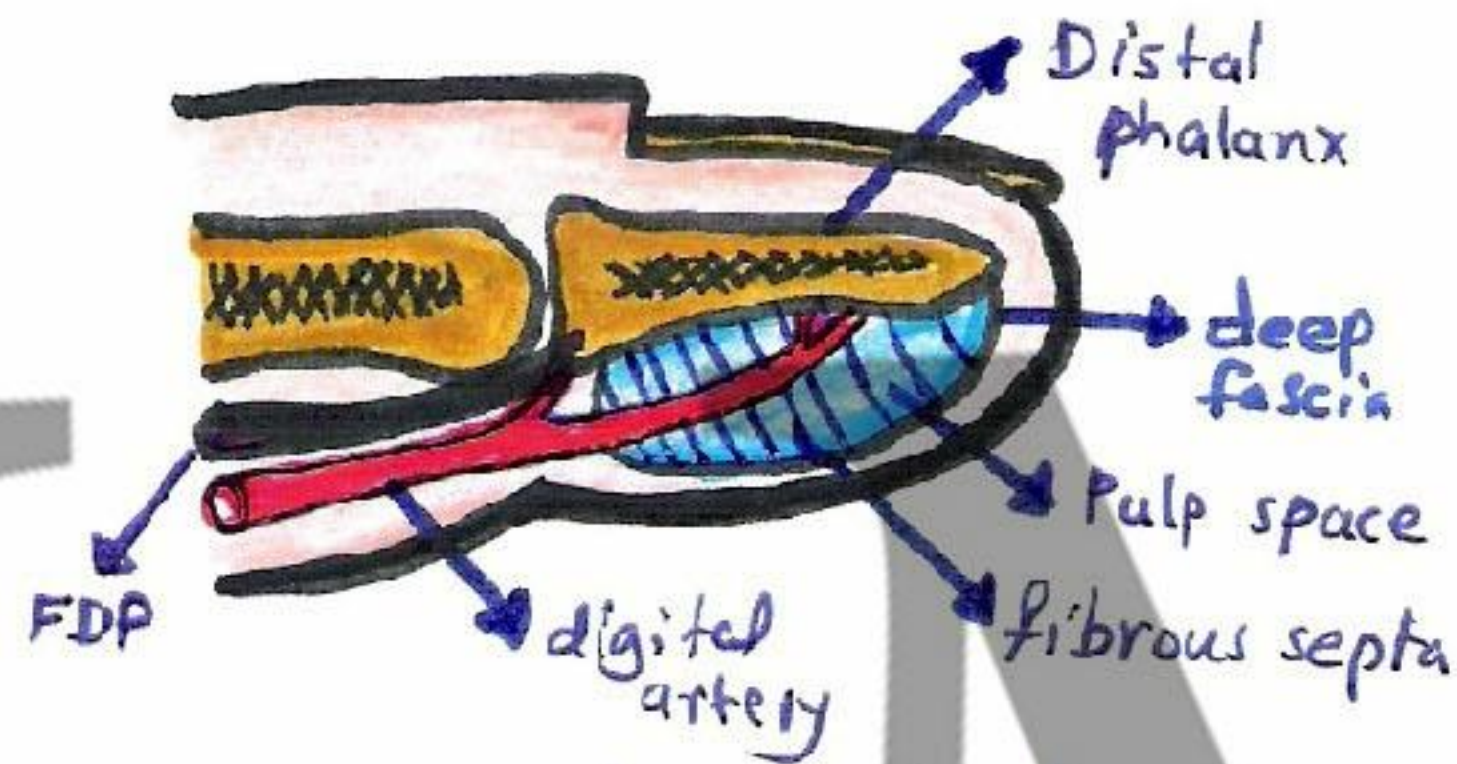
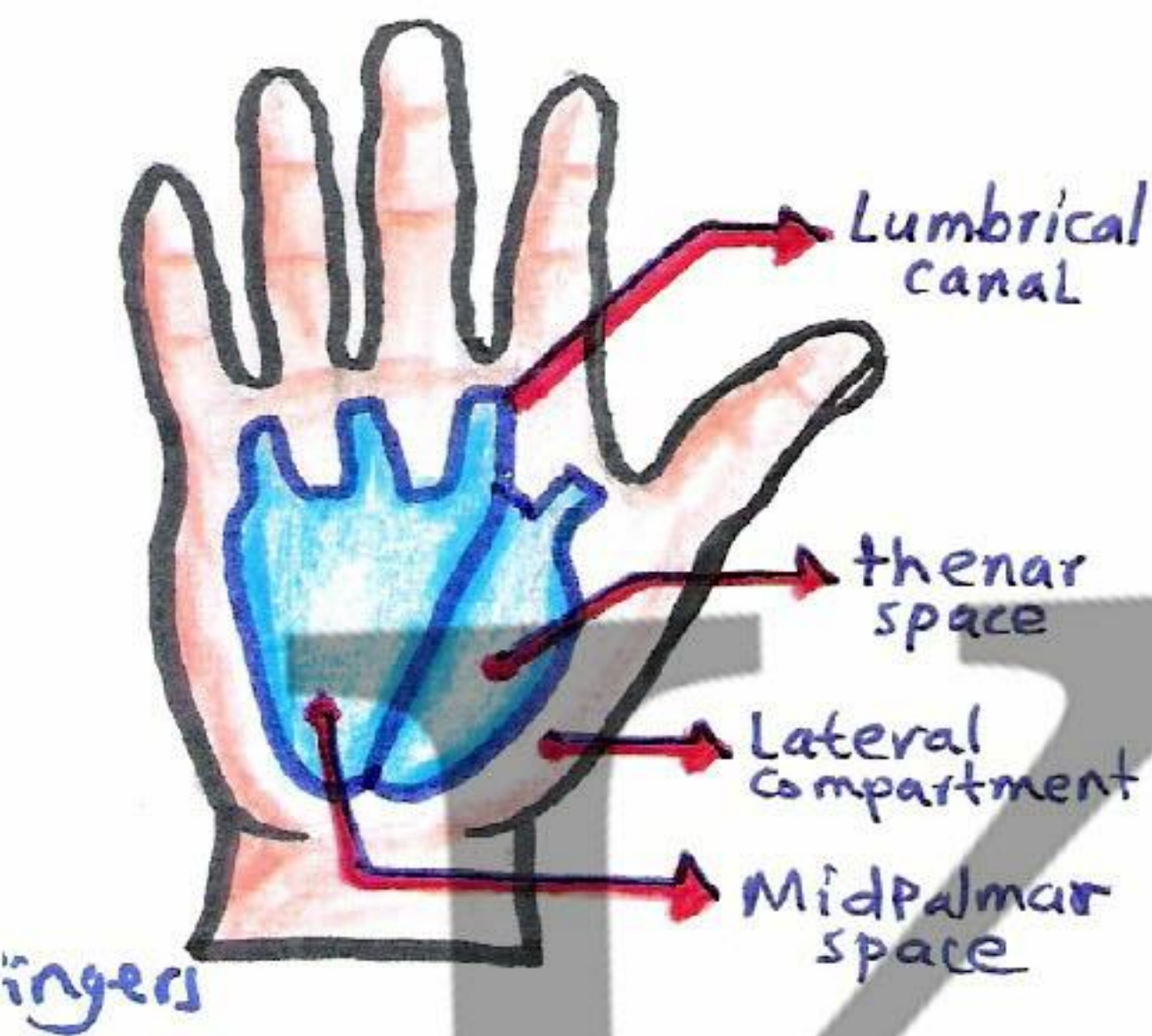
*NB:- Oblique cord:-

- Small fascial band between radius (below the radial tuberosity) & ulnar tuberosity.
- Its fibers are at right angle to fibers of interosseous membrane.



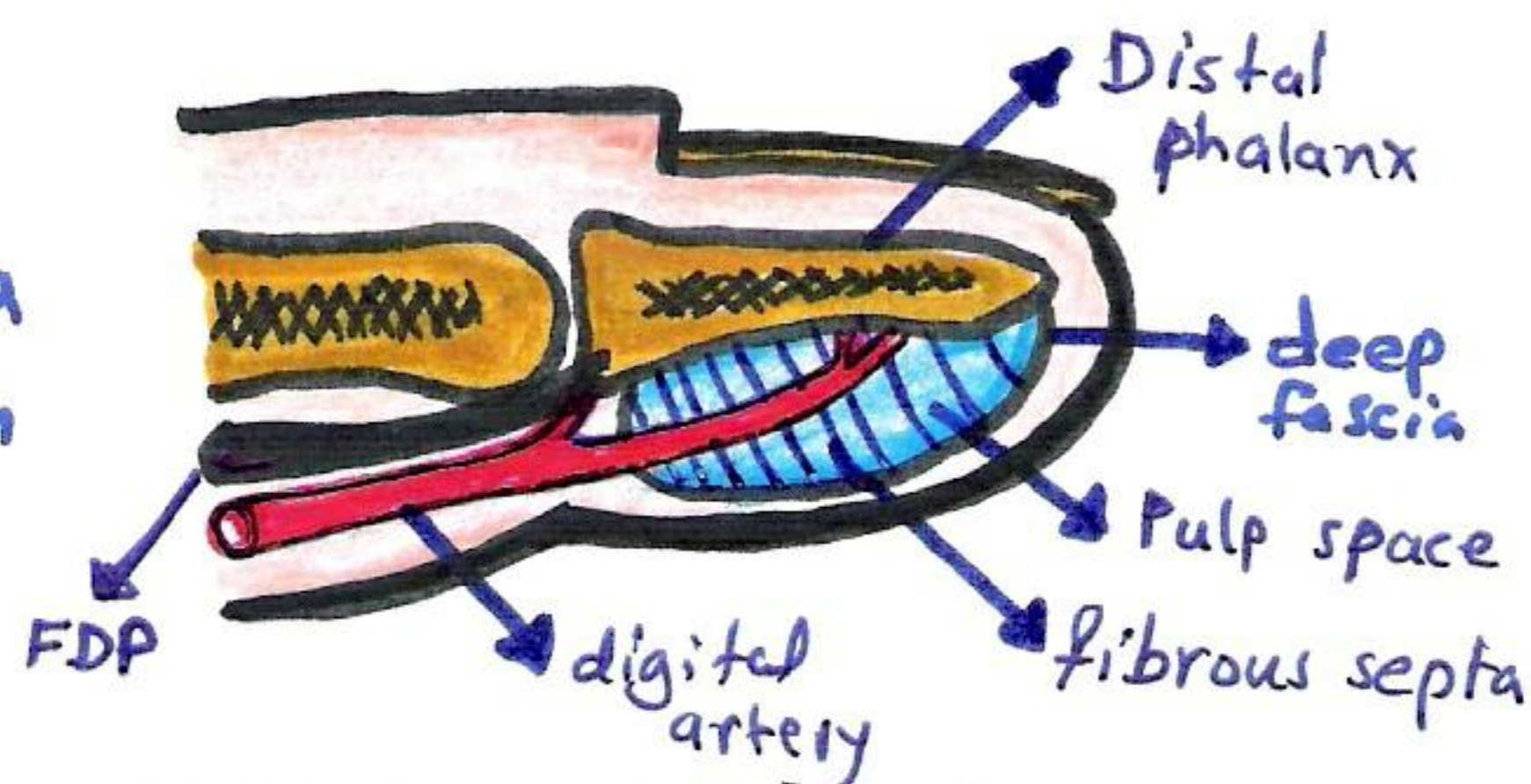
PALM SPACES





* Pulp space of fingers :-

- Space between deep fascia and distal phalanx, where deep fascia of the pulp fuses with periosteum of distal (terminal phalanx).
- It is divided by septa.
- Contains the terminal branch of digital artery that supplies diaphysis of terminal phalanx (the epiphysis receives its blood supply proximal to pulp space).

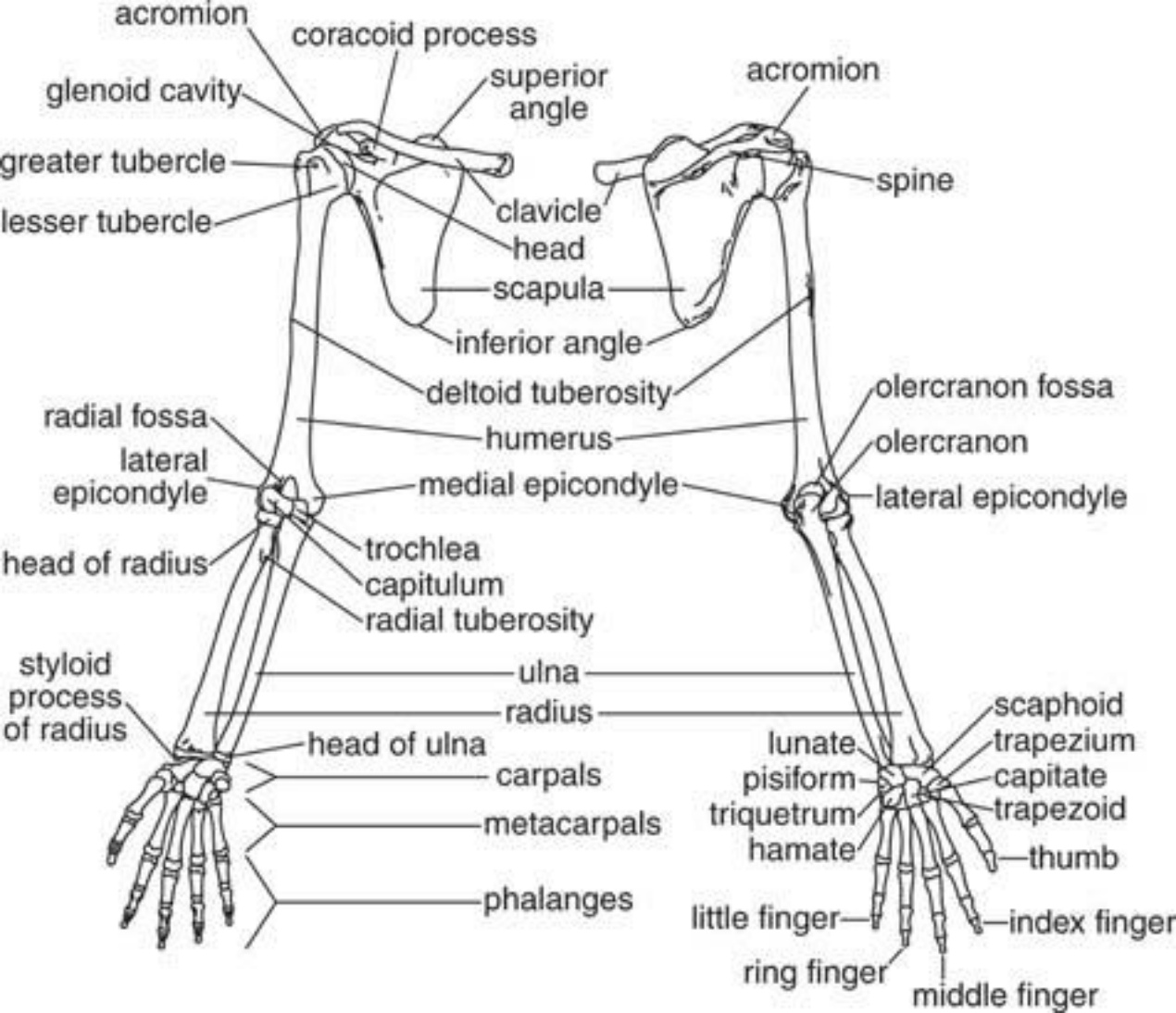


* Clinical notes:-

- Pulp space infection (Felon) is common and serious, mostly occurs in thumb & index by pinicks or needles.
- fascial spaces infection in the palm also can occur due to acute tenosynovitis with Pus formation.
- Tenosynovitis is an infection of synovial sheath that covering the tendons.
- Infection and Pus may spread proximally from synovial sheath to Palm spaces then under flexor retinaculum to enter the space between FDP and pronator quadratus (this space clinically called space of Parona).

NB:- Spaces related to hand are:-

- 1- Lateral compartment.
- 2- Medial compartment.
- 3- Intermediate comp.
 ↳ Thenar space.
 ↳ MidPalmar space.
- 4- Lumbrical canals.
- 5- Fibrous flexor sheath.
- 6- Pulp spaces of fingers.
- 7- spaces under flexor retinaculum.
- 8- compartments under extensor retinaculum.
- 9- anatomical snuffbox.
- 10- Tunnel of Guyon (40%).
- 11- space of Parona.



- Joints of upper limb.

Joint	articulation	type	capsule & synovial membr.	Ligament	N. supply
Sterno-clavicular Joint	• sternal end of clavicle, manubrium sterni & 1st costal cartilage. • divided by fibrocartilag. disc into medial & lat. compartments.	- synovial double plane joint. (?! saddle)	- Capsule attached to margins of articular surfaces. - synovial membrane lines the capsule	• anterior & posterior sternoclavicular ligaments - accessory ligament is Costo-clavicular lig. (bet 1st rib & under surface of clavicle)	• supra-scapular N. - Nerve to subclavius
acromio-clavicular	• between acromion of scapula & lateral end of clavicle	- synovial plane j.	- attached to ^{margin} articular surfaces & lined by synovial membrane.	• superior & inferior acromio-clavicular lig. - accessory → coracoclavicular lig.	• supra-scapular N.
Shoulder "gleno-humeral"	• head of humerus & glenoid cavity of scapula • fibrocart. disc (glenoid labrum) to deepens the joint surface.	- synovial ball & socket	- attached to margins (medially glenoid margin & laterally anatomical neck). - Synovial membrane lines the capsule & forms:- ① synovial sheath around long head of biceps. ② subscapular bursa ③ other bursae	①-glenohumeral ligaments ③ ②-transvers humeral (bet. lesser & greater tuberosities) ③-coracohumeral lig. with greater tuberosity ④-accessory → coracoacromial L. → subacromial bursa → deep to supraspinatus → deep to infraspinatus. → subcutaneous bursa over acromion	- axillary N. - suprascapular N.
Elbow	• Trochlea & capitulum of humerus • Trochlear notch of ulna & head of radius. intra tendinous olecranon subtendinous olecranon subcutaneous olecranon (student bursa)	- synovial hinge	- attached to margins of articular surfaces. - synovial m. lines capsule & fatty pads (fat in olecranon, coronoid & radial fossae). - Bursae related are ① Triceps & biceps bursa ② anconeus & ECRB " ③ subcutaneous bursa of med. & lat epicondyle	① lateral collateral lig. between lat. epicondyle of humerus & annular lig. ② Medial collateral lig. consists of • Ant. band:- bet. med. epicon. & coronoid process. • Post. band:- med. epicondyle & olecranon. • transvers band: between coronoid & olecranon. ③-accessory lig. → annular lig.	• Median N. • ulnar N. • Radial N. - Musculocut. N.

Joint	Articulation	type	capsule & S. memb.	ligaments	N/s
Proximal radio-ulnar J.	• head of radius & radial notch of ulna + annular ligament.	- synovial pivot	- capsule encloses the joint & continuous with elbow joint. - syn. memb. lines capsule & continue w elbow.	- annular ligament :- (attached to ant. & post. margins of radial notch on ulna.) - Quadrate lig.	as elbow (M.U.R & musculocut)
Distal radio-ulnar J.	- head of ulna & ulnar notch of radius - articular disc : triangular fibrocartilage attached by apex to styloid process & base to ulnar notch of Radius.	- synovial pivot.	- attach to margins of articular surface - syn. m. lines capsule	- anterior & posterior lig.	- anterior & posterior interosseous N.
Wrist (radio-carpal J.)	① distal end of radius & articular disc above ② scaphoid, lunate & triquetral below	- synovial ellipsoid	- capsule encloses the joint. - s. membrane lines the capsule	① anterior & post. ligaments ② - Medial lig. (styloid process of ulna & triquetral). ③ - lat. lig. (styloid of radius & scaphoid).	- anterior & posterior interosseous nerve.

* Notes :-

- Intercarpal & carpometacarpal joints :- are synovial plane with gliding movement, supplied by anterior & post. interosseous N. & deep branch of ulnar Nerve.
- Carpometacarpal joint of thumb :- is synovial saddle between trapezium & base of 1st metacarpal bone.
- Metacarpo-phalangeal joints :- are synovial condyloid with palmar & collateral ligaments.
- Interphalangeal joints :- are synovial hinge.
- Sterno-clavicular & acromio clavicular joints are joints of shoulder girdle and movement of shoulder girdle are elevation, depression, ^{V-shaped} protraction, retraction, downward rotation & upward rotation.
- Coraco-clavicular lig :- is the strongest lig., attached by apex to coracoid process below & the upper attachment divided into ① conoid part to conoid tubercle & ② trapezoid part to trapezoid line.

Notes:-*** Movements of the shoulder girdle are:-**

1. Elevation: by levator scapulae + trapezius (upper fibers).
2. Depression: by pectoralis minor & major. [PM_n + PM_J]
3. Protraction: by serratus anterior + pectoralis minor [SA + PM_n].
4. Retraction: by trapezius (middle fibers) + rhomboid minor.
5. Upward rotation: by trapezius (lower fs) + serratus anterior
6. Downward rotation: by rhomboid minor & major + Pectoralis minor.

- * Capsule of shoulder joint is lax and weak specially inferiorly so may cause dislocation of shoulder inferiorly.
- Capsule of shoulder joint is attached to anatomical neck except inferiorly where it extends 1-2 cm on surgical neck.
- Capsule of shoulder joint has 2 holes in front one for subscapular bursa (communicate with cavity of joint) & other for long head of the biceps (intracapsular extra synovial).

*** Rotator cuff muscles:-** ① subscapularis ② supraspinatus.
 ③ infraspinatus ④ teres minor

- stability of shoulder joint depends on:- capsule, ligaments, shape of the bone, surrounding tendons (rotator cuff ms & long heads of biceps & triceps).
- Abduction mechanism of shoulder joint is as follows:
 - 1 - from 0-15° :- supraspinatus.
 - 2 - from 15-90° :- deltoid ms (middle fibers).
 - 3 - > 90° :- rotation of scapula by trapezius & serratus anterior.

- * Coraco-acromial arch:- is the secondary socket for head of humerus
 - it is formed of ① coracoid process ② acromion process and ③ coraco-acromial ligament.

* Movements of shoulder joint:-

- Flexion → Pectoralis major (clavicular head), biceps, coracobrachialis and deltoid (anterior fibers).
- Extension → deltoid (post. fibers), teres major, latissimus dorsi.
- Abduction → supraspinatus (0-15°), deltoid "middle fibers" (15-90°).
- Adduction → muscles of bicipital groove & supscapularis.
- Med. rotation → subscapularis & deltoid (ant. fs) (fs = fibers)
- Lat. rotation → infraspinatus, teres minor & deltoid (post. fs).
- Circumduction → summation of all movement.

* Relations of shoulder joint:-

- Anterior → subscapularis & its bursa.
- Posterior → infraspinatus & its bursa + teres minor.
- Superior → supraspinatus & its subacromial bursa + long head of biceps.
- Inferior → axillary N., + post. circumflex humeral artery + long head of Triceps

* Movements of elbow joint:-

- Flexion → brachialis, biceps brachii, muscles attached to med. epicondyle
- Extension → triceps, anconeus, ms attached to lat. epicondyle

* Relations of elbow joint:-

- Anterior → brachialis, cubital fossa.
- Posterior → anconeus + triceps.
- Medial → Ulnar N. + common flexor origin.
- Lateral → radial N. + common extensor origin.

* Movements of radioulnar joints:-

- Supination → supinator (if elbow extended), biceps (if flexed)
- Pronation → pronator teres & quadratus.

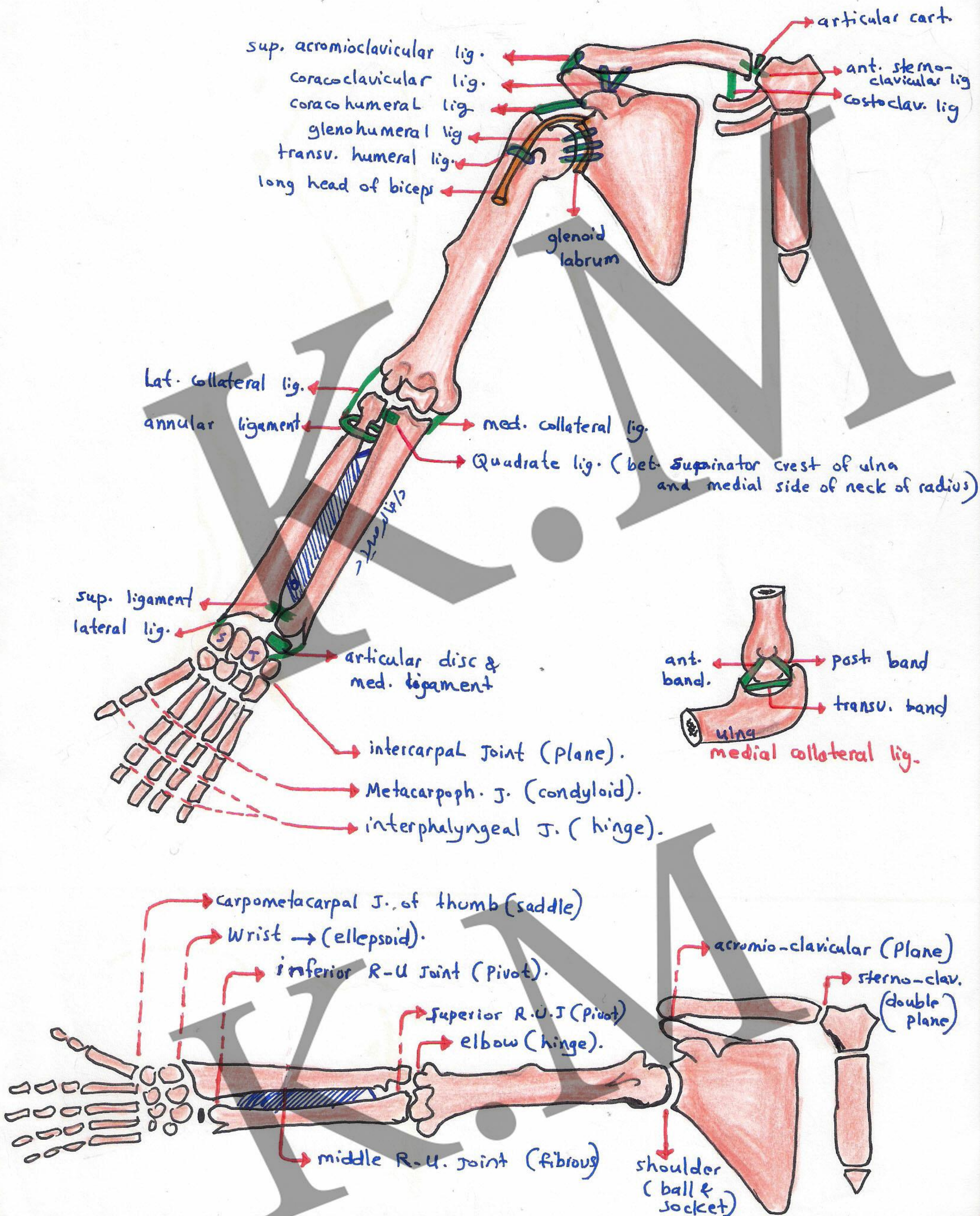
* Movement of wrist joint :-

- Flexion → all muscles of ant. compartment of forearm (except pronator teres & quadratus).
- Extension → all muscles of back forearm starting by extensor.
- Abduction → abductor pollicis longus & the 3 carpi radialis
- Adduction → the 2 carpi ulnaris ms. (FCU, FCR)

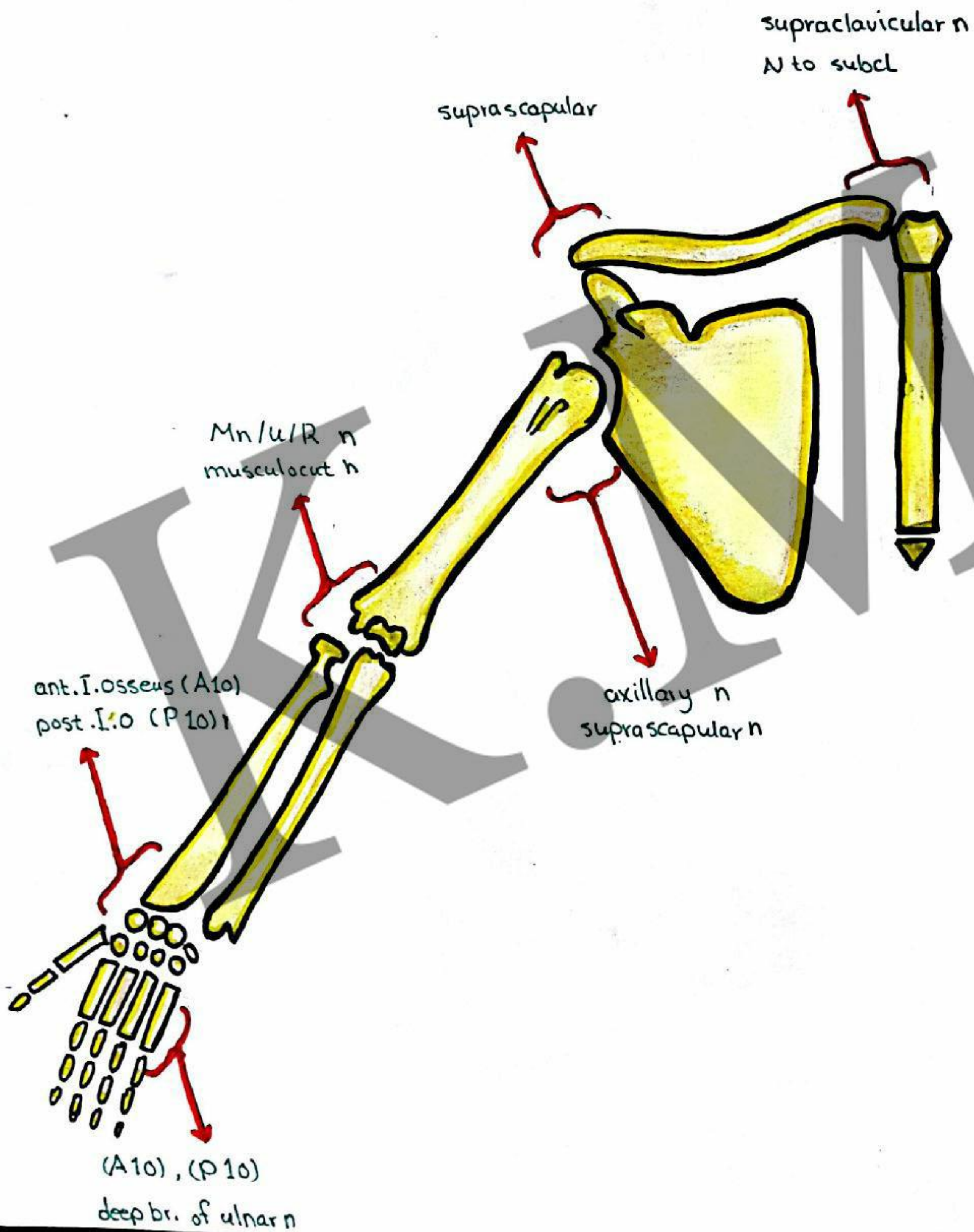
* Relation of wrist joint :-

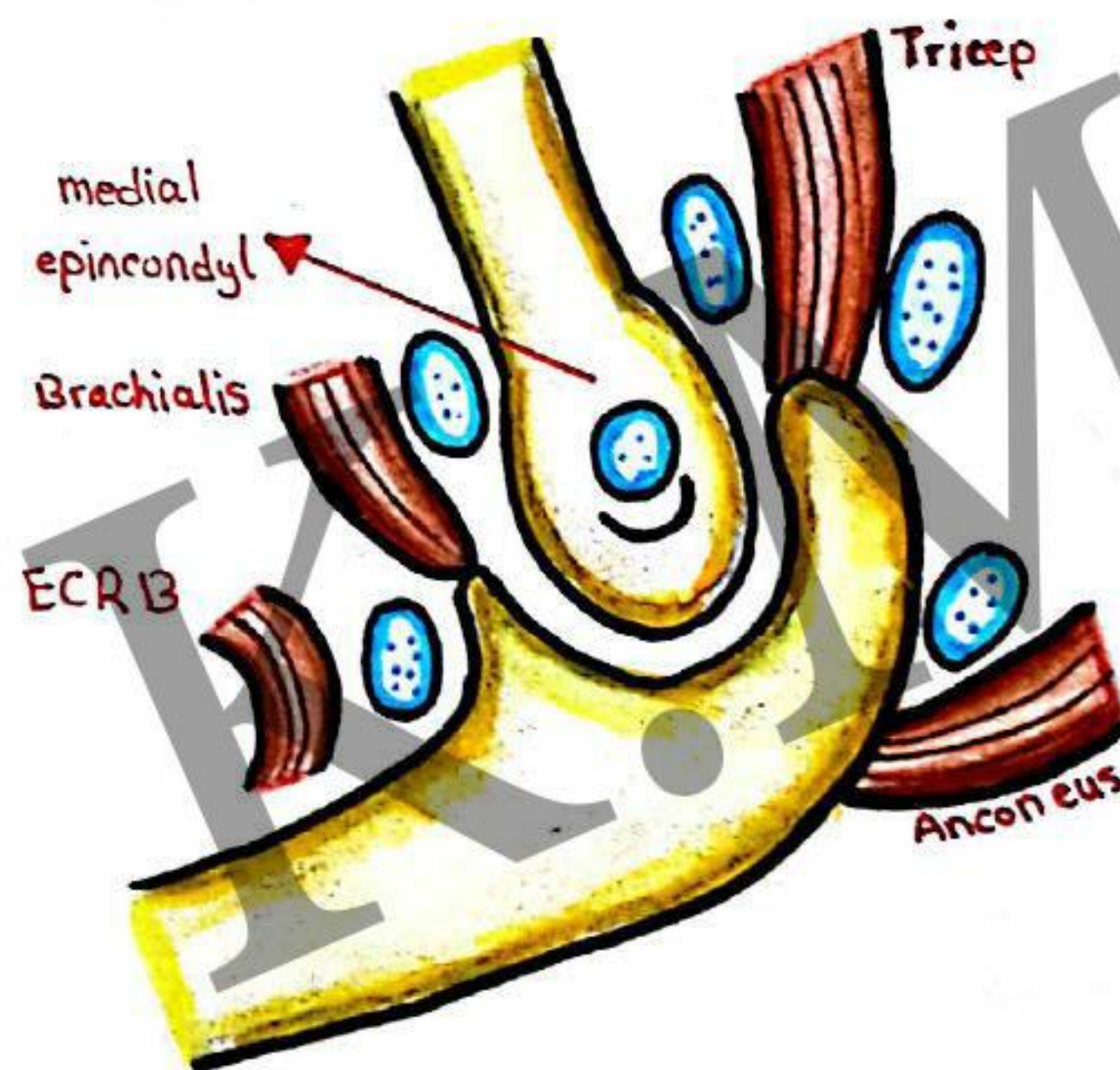
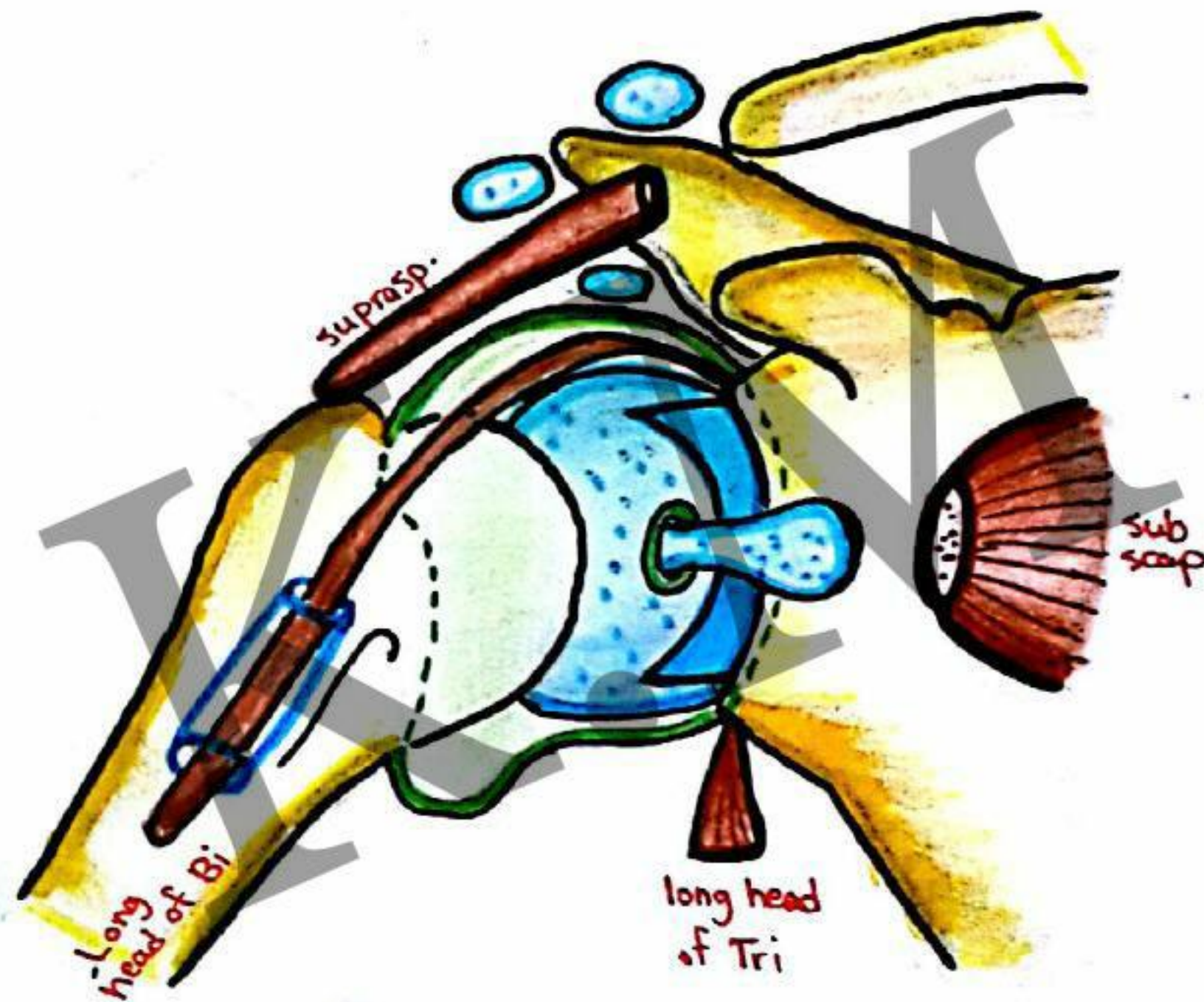
- Anterior → contents of carpal tunnel.
- Posterior → compartments under extensor retinaculum²⁻⁶ (except 1st)
- Medial → dorsal cut. branch of ulnar N.
- Lateral → 1st compartment of ext. retinaculum + radial a + cephalic v

Joints of upper limb.



N/S of joints



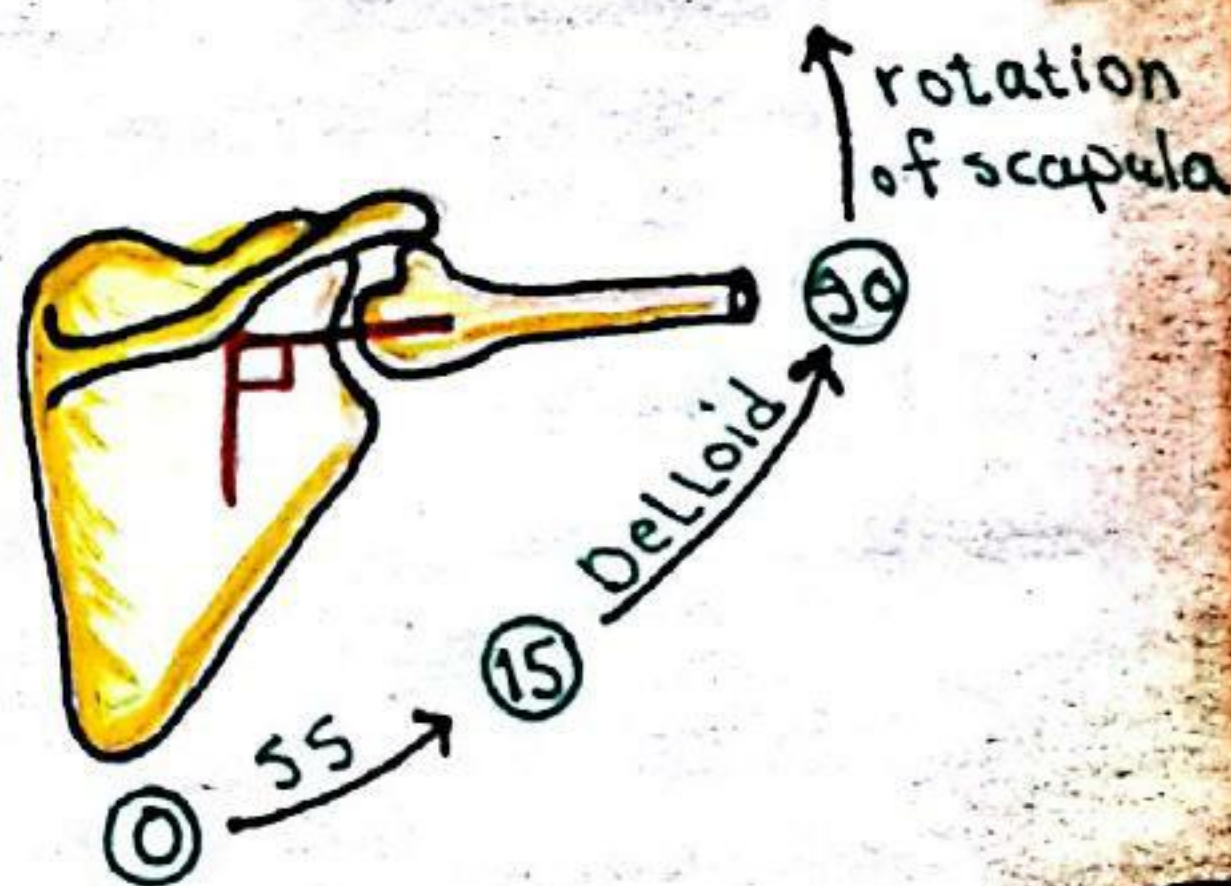


Abduction mechanism

0-15° → supraspinatus

15-90° → deltoid (middle fibers)

>90° → rotation of scapula
by trapezius & serratus anterior



* Rotator cuff muscles:-

- supscapularis, supraspinatus
- infraspinatus, teres minor

* Muscles attached to greater tuberosity:-

- supraspinatus
- infraspinatus
- teres minor

* Mus att. to coracoid process:-

- coracobrachialis
- short head of biceps } → tip
- pectoralis minor → base

* Mus att. to bicipital groove:-

- pectoralis major → lateral lip
- teres major → medial lip
- latissimus dorsi → floor

Table Muscles Connecting the Scapula to the Humerus

Muscle	Origin	Insertion	Nerve Supply	Nerve Roots ^a	Action
Deltoid	Lateral third of clavicle, acromion, spine of scapula	Middle of lateral surface of shaft of humerus	Axillary nerve	C5, 6	Abducts arm; anterior fibers flex and medially rotate arm; posterior fibers extend and laterally rotate arm
Supraspinatus	Supraspinous fossa of scapula	Greater tuberosity of humerus; capsule of shoulder joint	Suprascapular nerve	C4, 5, 6	Abducts arm and stabilizes shoulder joint
Infraspinatus	Infraspinous fossa of scapula	Greater tuberosity of humerus; capsule of shoulder joint	Suprascapular nerve	(C4), 5, 6	Laterally rotates arm and stabilizes shoulder joint
Teres major	Lower third of lateral border of scapula	Medial lip of bicipital groove of humerus	Lower subscapular nerve	C6, 7	Medially rotates and adducts arm and stabilizes shoulder joint
Teres minor	Upper two thirds of lateral border of scapula	Greater tuberosity of humerus; capsule of shoulder joint	Axillary nerve	(C4), C5, 6	Laterally rotates arm and stabilizes shoulder joint
Subscapularis	Subscapular fossa	Lesser tuberosity of humerus	Upper and lower subscapular nerves	C5, 6, 7	Medially rotates arm and stabilizes shoulder joint

^a The predominant nerve root supply is indicated by boldface type.

Table Muscles of the Arm

Muscle	Origin	Insertion	Nerve Supply	Nerve Roots ^a	Action
Anterior Compartment					
Biceps brachii					
Long head	Supraglenoid tubercle of scapula	Tuberosity of radius and bicipital aponeurosis into deep fascia of forearm	Musculocutaneous nerve	C5, 6	Supinator of forearm and flexor of elbow joint; weak flexor of shoulder joint
Short head	Coracoid process of scapula				
Coracobrachialis	Coracoid process of scapula	Medial aspect of shaft of humerus	Musculocutaneous nerve	C5, 6, 7	Flexes arm and also weak adductor
Brachialis	Front of lower half of humerus	Coronoid process of ulna	Musculocutaneous nerve	C5, 6	Flexor of elbow joint
Posterior Compartment					
Triceps					
Long head	Infraglenoid tubercle of scapula				
Lateral head	Upper half of posterior surface of shaft of humerus	Olecranon process of ulna	Radial nerve	C6, 7, 8	Extensor of elbow joint
Medial head	Lower half of posterior surface of shaft of humerus				

^a The predominant nerve root supply is indicated by boldface type.

Table Muscles of the Anterior Fascial Compartment of the Forearm

Muscle	Origin	Insertion	Nerve Supply	Nerve Roots ^a	Action
Pronator teres					
Humeral head	Medial epicondyle of humerus	Lateral aspect of shaft of radius	Median nerve	C6, 7	Pronation and flexion of forearm
Ulnar head	Medial border of coronoid process of ulna				
Flexor carpi radialis	Medial epicondyle of humerus	Bases of second and third metacarpal bones	Median nerve	C6, 7	Flexes and abducts hand at wrist joint
Palmaris longus	Medial epicondyle of humerus	Flexor retinaculum and palmar aponeurosis	Median nerve	C7, 8	Flexes hand
Flexor carpi ulnaris					
Humeral head	Medial epicondyle of humerus	Pisiform bone, hook of the hamate, base at fifth metacarpal bone	Ulnar nerve	C8; T1	Flexes and adducts hand at wrist joint
Ulnar head	Medial aspect of olecranon process and posterior border of ulna				
Flexor digitorum superficialis					
Humeroulnar head	Medial epicondyle of humerus; medial border of coronoid process of ulna	Middle phalanx of medial four fingers	Median nerve	C7, 8; T1	Flexes middle phalanx of fingers and assists in flexing proximal phalanx and hand
Radial head	Oblique line on anterior surface of shaft of radius				
Flexor pollicis longus	Anterior surface of shaft of radius	Distal phalanx of thumb	Anterior interosseous branch of median nerve	C8; T1	Flexes distal phalanx of thumb
Flexor digitorum profundus	Anteromedial surface of shaft of ulna	Distal phalanges of medial four fingers	Ulnar (medial half) and median (lateral half) nerves	C8; T1	Flexes distal phalanx of fingers; then assists in flexion of middle and proximal phalanges and wrist
Pronator quadratus	Anterior surface of shaft of ulna	Anterior surface of shaft of radius	Anterior interosseous branch of median nerve	C8; T1	Pronates forearm

^a The predominant nerve root supply is indicated by boldface type.

Table Muscles of the Lateral Fascial Compartment of the Forearm

Muscle	Origin	Insertion	Nerve Supply	Nerve Roots ^a	Action
Brachioradialis	Lateral supracondylar ridge of humerus	Base of styloid process of radius	Radial nerve	C5, 6, 7	Flexes forearm at elbow joint; rotates forearm to the midprone position
Extensor carpi radialis longus	Lateral supracondylar ridge of humerus	Posterior surface of base of second metacarpal bone	Radial nerve	C6, 7	Extends and abducts hand at wrist joint

^a The predominant nerve root supply is indicated by boldface type.

Table Muscles of the Posterior Fascial Compartment of the Forearm

Muscle	Origin	Insertion	Nerve Supply	Nerve Roots ^a	Action
Extensor carpi radialis brevis	Lateral epicondyle of humerus	Posterior surface of base of third metacarpal bone	Deep branch of radial nerve	C7, 8	Extends and abducts hand at wrist joint
Extensor digitorum	Lateral epicondyle of humerus	Middle and distal phalanges of medial four fingers	Deep branch of radial nerve	C7, 8	Extends fingers and hand (see text for details)
Extensor digiti minimi	Lateral epicondyle of humerus	Extensor expansion of little finger	Deep branch of radial nerve	C7, 8	Extends metacarpal phalangeal joint of little finger
Extensor carpi ulnaris	Lateral epicondyle of humerus	Base of fifth metacarpal bone	Deep branch of radial nerve	C7, 8	Extends and adducts hand at wrist joint
Anconeus	Lateral epicondyle of humerus	Lateral surface of olecranon process of ulna	Radial nerve	C7, 8; T1	Extends elbow joint
Supinator	Lateral epicondyle of humerus, anular ligament of proximal radioulnar joint, and ulna	Neck and shaft of radius	Deep branch of radial nerve	C5, 6	Supination of forearm
Abductor pollicis longus	Posterior surface of shafts of radius and ulna	Base of first metacarpal bone	Deep branch of radial nerve	C7, 8	Abducts and extends thumb
Extensor pollicis brevis	Posterior surface of shaft of radius	Base of proximal phalanx of thumb	Deep branch of radial nerve	C7, 8	Extends metacarpophalangeal joints of thumb
Extensor pollicis longus	Posterior surface of shaft of ulna	Base of distal phalanx of thumb	Deep branch of radial nerve	C7, 8	Extends distal phalanx of thumb
Extensor indicis	Posterior surface of shaft of ulna	Extensor expansion of index finger	Deep branch of radial nerve	C7, 8	Extends metacarpophalangeal joint of index finger

^a The predominant nerve root supply is indicated by boldface type.

Table . Small Muscles of the Hand

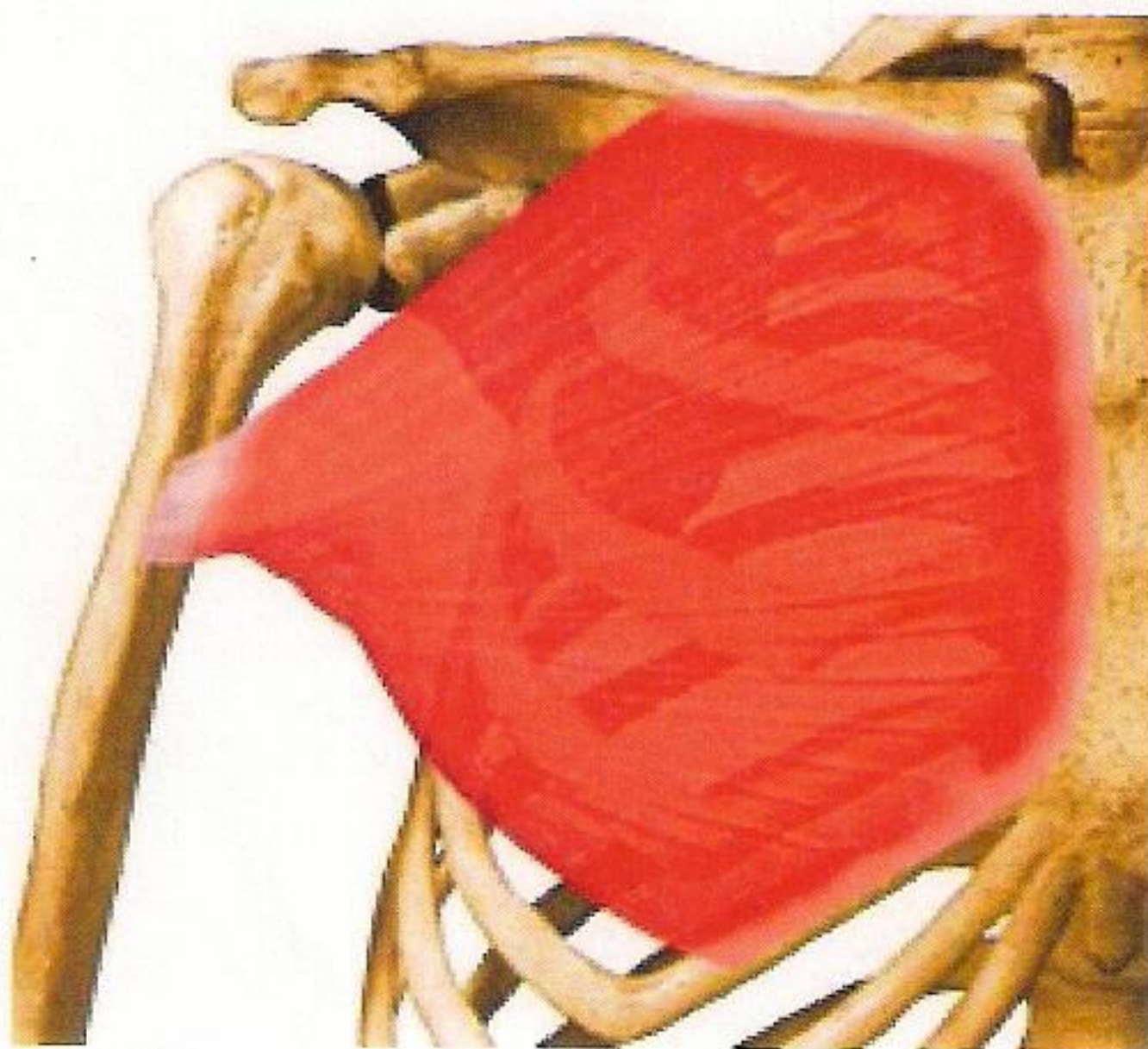
Muscle	Origin	Insertion	Nerve Supply	Nerve Roots^a	Action
Palmaris brevis	Flexor retinaculum, palmar aponeurosis	Skin of palm	Superficial branch of ulnar nerve	C8; T1	Corrugates skin to improve grip of palm
Lumbricals (4)	Tendons of flexor digitorum profundus	Extensor expansion of medial four fingers	First and second, i.e., lateral two, median nerve; third and fourth deep branch of ulnar nerve	C8; T1	Flex metacarpophalangeal joints and extend interphalangeal joints of fingers except thumb
Interossei (8) Palmar (4)	First arises from base of first metacarpal; remaining three from anterior surface of shafts of second, fourth, and fifth metacarpals	Proximal phalanges of thumb, index, ring, and little fingers and dorsal extensor expansion of each finger (Fig. 9-67)	Deep branch of ulnar nerve	C8; T1	Palmar interossei adduct fingers toward center of third finger
Dorsal (4)	Contiguous sides of shafts of metacarpal bones	Proximal phalanges of index, middle and ring fingers and dorsal extensor expansion (Fig. 9-67)	Deep branch of ulnar nerve	C8; T1	Dorsal interossei abduct fingers from center of third finger; both palmar and dorsal flex metacarpophalangeal joints and extend interphalangeal joints
Short Muscles of Thumb					
Abductor pollicis brevis	Scaphoid, trapezium, flexor retinaculum	Base of proximal phalanx of thumb	Median nerve	C8; T1	Abduction of thumb
Flexor pollicis brevis	Flexor retinaculum	Base of proximal phalanx of thumb	Median nerve	C8; T1	Flexes metacarpophalangeal joint of thumb
Opponens pollicis	Flexor retinaculum	Shaft of metacarpal bone of thumb	Median nerve	C8; T1	Pulls thumb medially and forward across palm
Adductor pollicis	Oblique head; second and third metacarpal bones; transverse head; third metacarpal bone	Base of proximal phalanx of thumb	Deep branch of ulnar nerve	C8; T1	Adduction of thumb
Short Muscles of Little Finger					
Abductor digiti minimi	Pisiform bone	Base of proximal phalanx of little finger	Deep branch of ulnar nerve	C8; T1	Abducts little finger
Flexor digiti minimi	Flexor retinaculum	Base of proximal phalanx of little finger	Deep branch of ulnar nerve	C8; T1	Flexes little finger
Opponens digiti minimi	Flexor retinaculum	Medial border fifth metacarpal bone	Deep branch of ulnar nerve	C8; T1	Pulls fifth metacarpal forward as in cupping the palm

^a The predominant nerve root supply is indicated by boldface type.

MUSCLES OF THE UPPER LIMB

I- MUSCLES AROUND AXILLA

A- MUSCLES CONNECTING THE UPPER LIMB TO THORACIC WALL



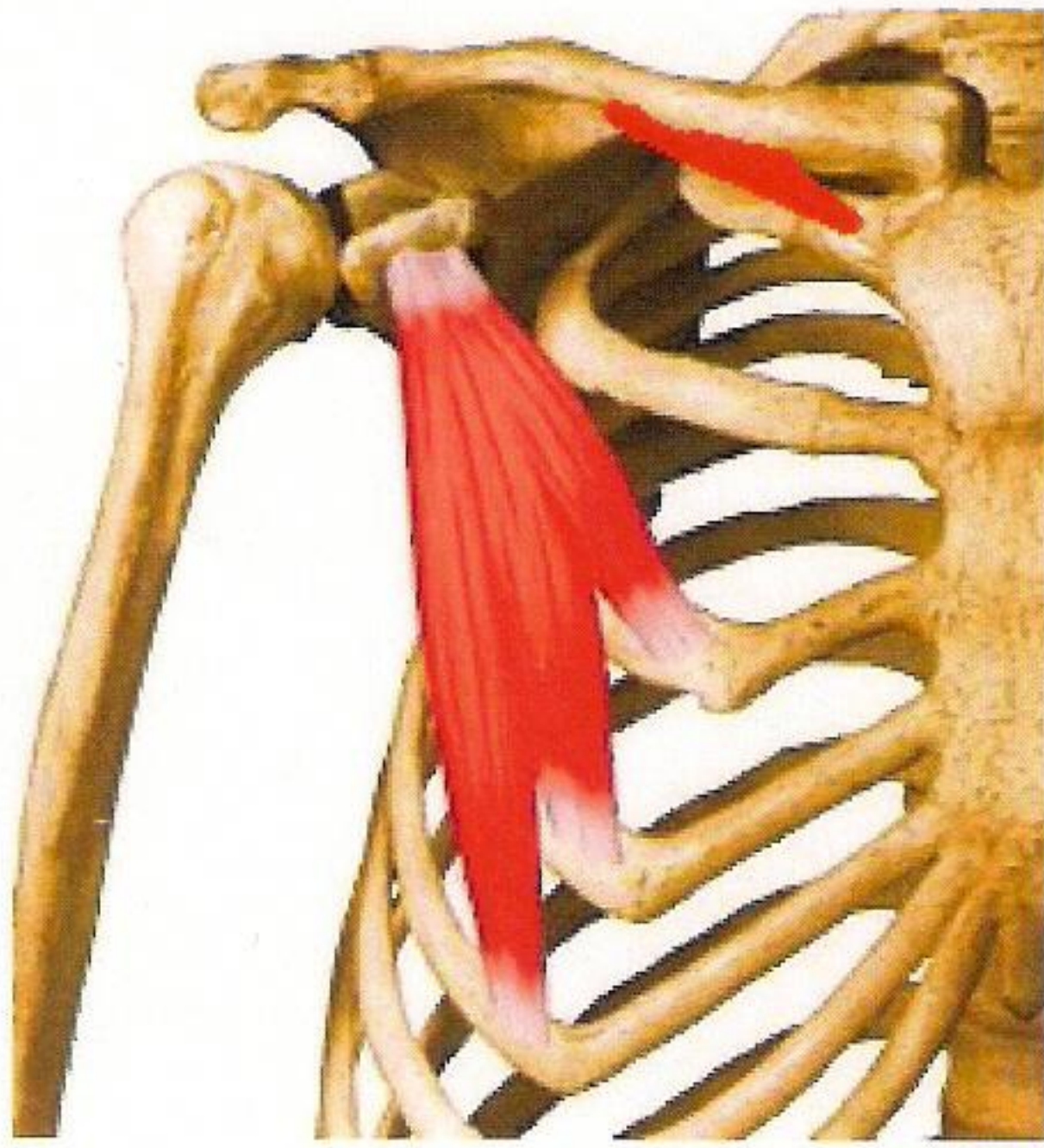
1- pectoralis major

Origin:- from the medial half of the clavicle from the sternum and from the upper six costal cartilages

Insertion:- lateral lip of the bicipital groove of humerus

Nerve supply:- medial & lateral pectoral nerve

Action:- adduction & medial rotation of the arm, flexion of arm (by clavicular fibers)



2- pectoralis minor

Origin:- from the third . fourth, & fifth ribs

Insertion:- the coracoid process of the scapula

Nerve supply:-medial pectoral nerve

Action:- depression of shoulder, if scapula fixed it elevates ribs

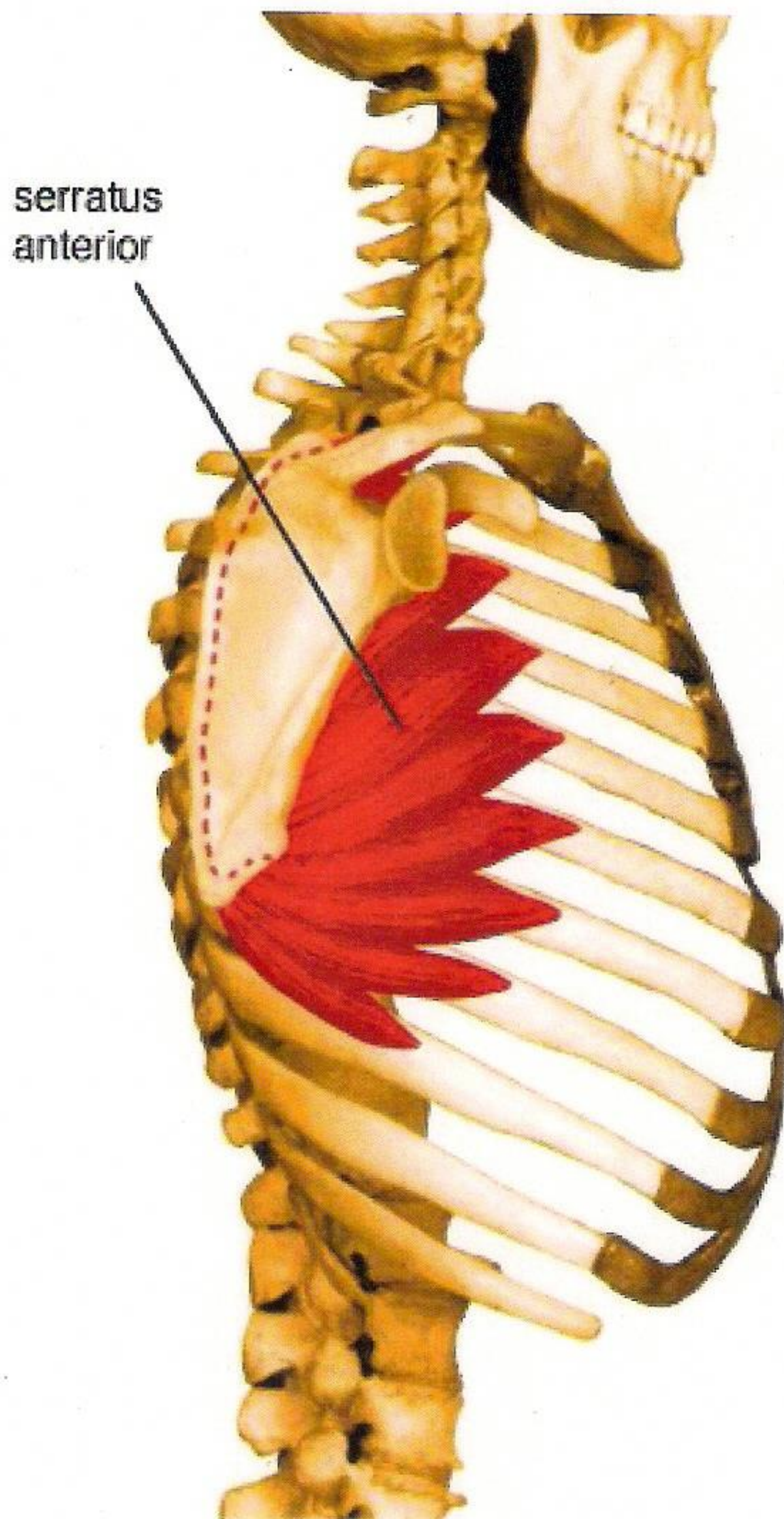
3- Subclavius

Origin:- from the first costal cartilage

Insertion:- groove on inferior surface of clavicle

Nerve supply:- nerve to subclavius (upper trunk)

Action:- Depresses the clavicle and steadies this bone during movements of the shoulder girdle



4-Serratus anterior

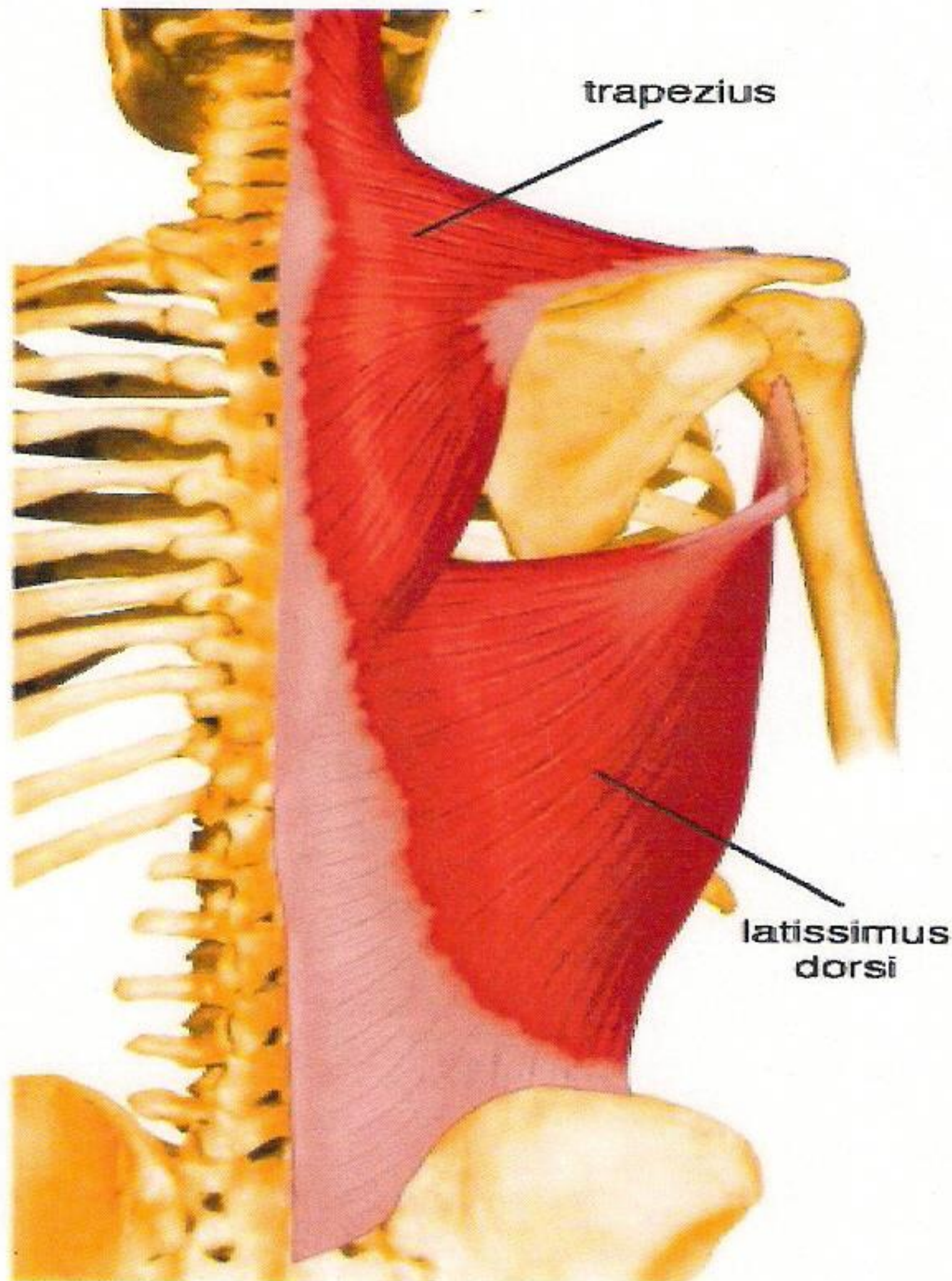
Origin:- from the outer surfaces of the upper eight ribs

Insertion:- the medial border and inferior angle of the scapula

Nerve supply:- long thoracic nerve (C5,6,7)

Action:- protraction and rotation of scapula

B- MUSCLES CONNECTING THE UPPER LIMB TO VERTEBRAL COLUMN



1-Trapezius

Origin:- occipital (medial third of superior nuchal line, external occipital protuberance), ligamentum nuchae, spines of the seventh cervical, spine of all thoracic vertebrae & their supraspinous ligaments

Insertion:-

Upper fibers:- lateral third of clavicle (posterior border)

Medial fibers:-medial border of acromion

Lower fibers:- spine of scapula

Nerve supply:- spinal root of accessory nerve (motor) & C3, C4(sensory)

Action:-

Upper fibers:- elevation of shoulder girdle

Middle fibers:-retraction of the scapula

Lower fibers:-depression of the scapula

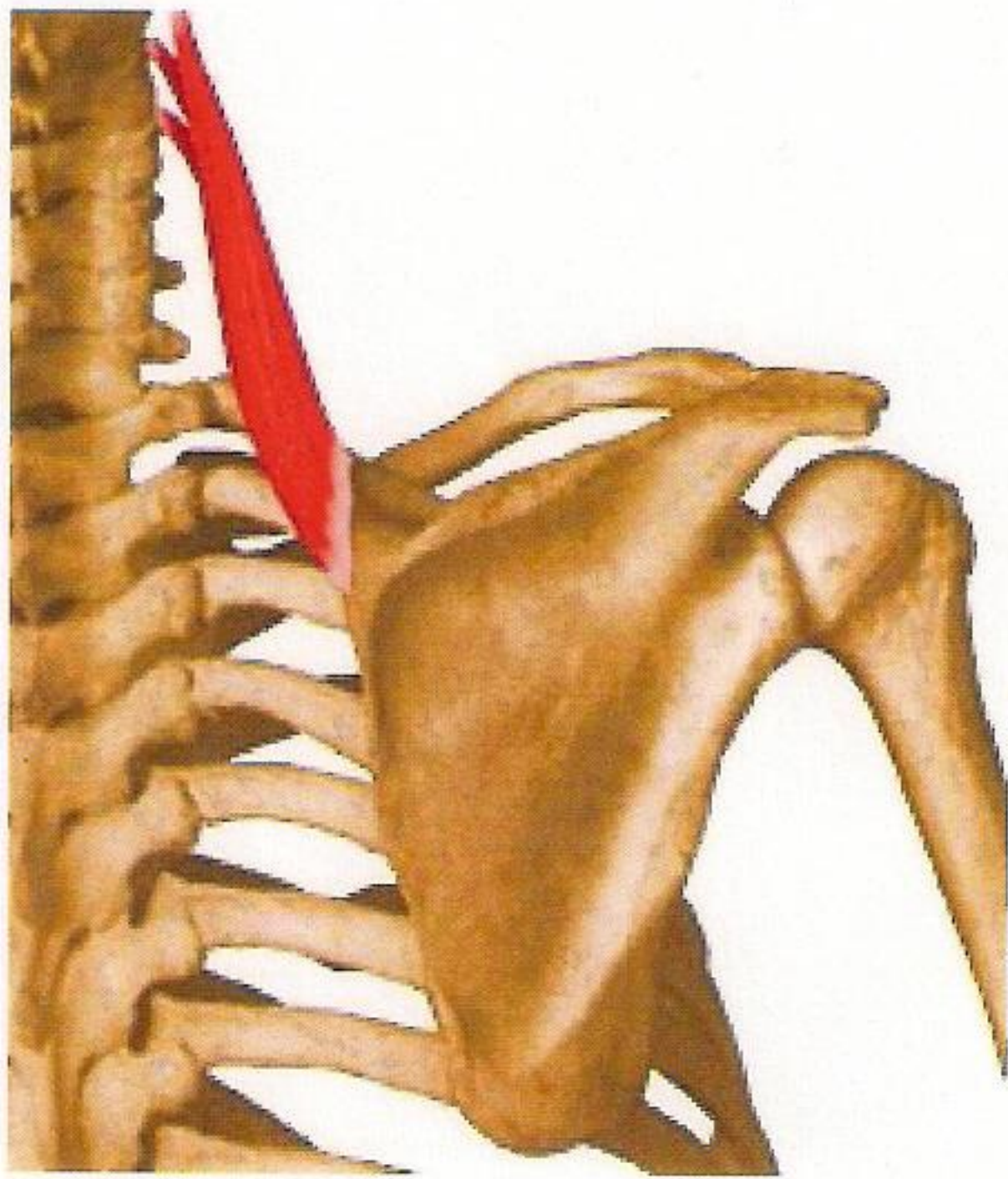
2- Latissimus dorsi

Origin:- spines of lower 6 thoracic vertebrae & supraspinous ligaments & lower 4 ribs, posterior layer of thoracolumbar fascia, posterior part of outer lip of iliac crest, back of inferior angle of scapula

Insertion:- floor of bicipital groove of humerus

Nerve supply:- thoracodorsal nerve (C6,7,8)

Action:- adductor, extensor & medial rotator of arm



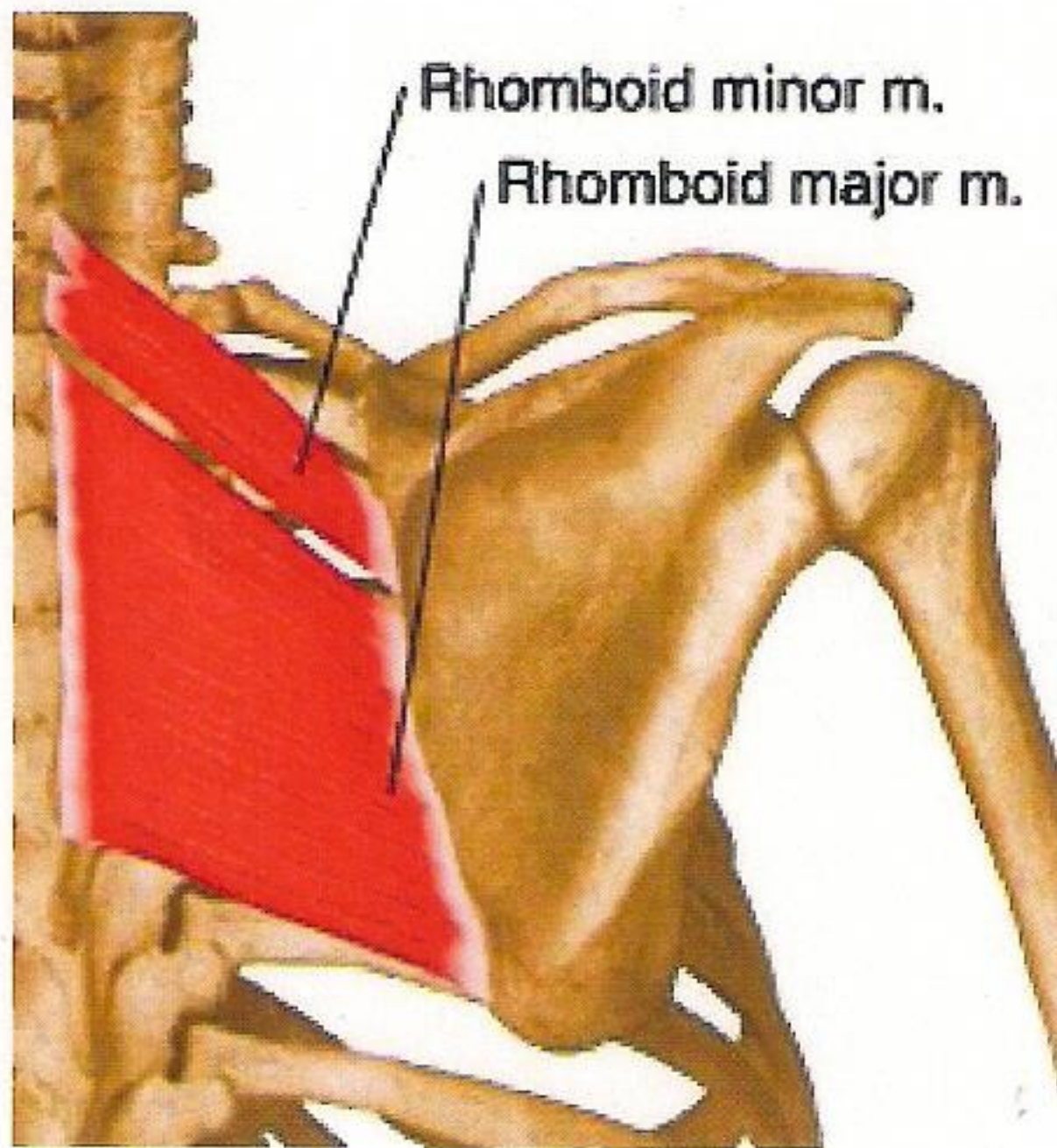
3- Levator scapula

Origin:- transverse processes of upper four cervical vertebrae

Insertion:- the medial border of the scapula, from superior angle to root of its spine (above spine)

Nerve supply:- dorsal scapular nerve (C5) & third & fourth cervical nerve (cervical plexus)

Action:- elevation of the scapula & retraction of the scapula



4- Rhomboideus major

Origin:- from the second to the fifth thoracic spines & related supraspinous ligaments

Insertion:- the medial border of scapula from root of spine to inferior angle of scapula (below spine)

Nerve supply:- dorsal scapular nerve (C 5)

Action:- retraction of the shoulder

5- Rhomboideus minor

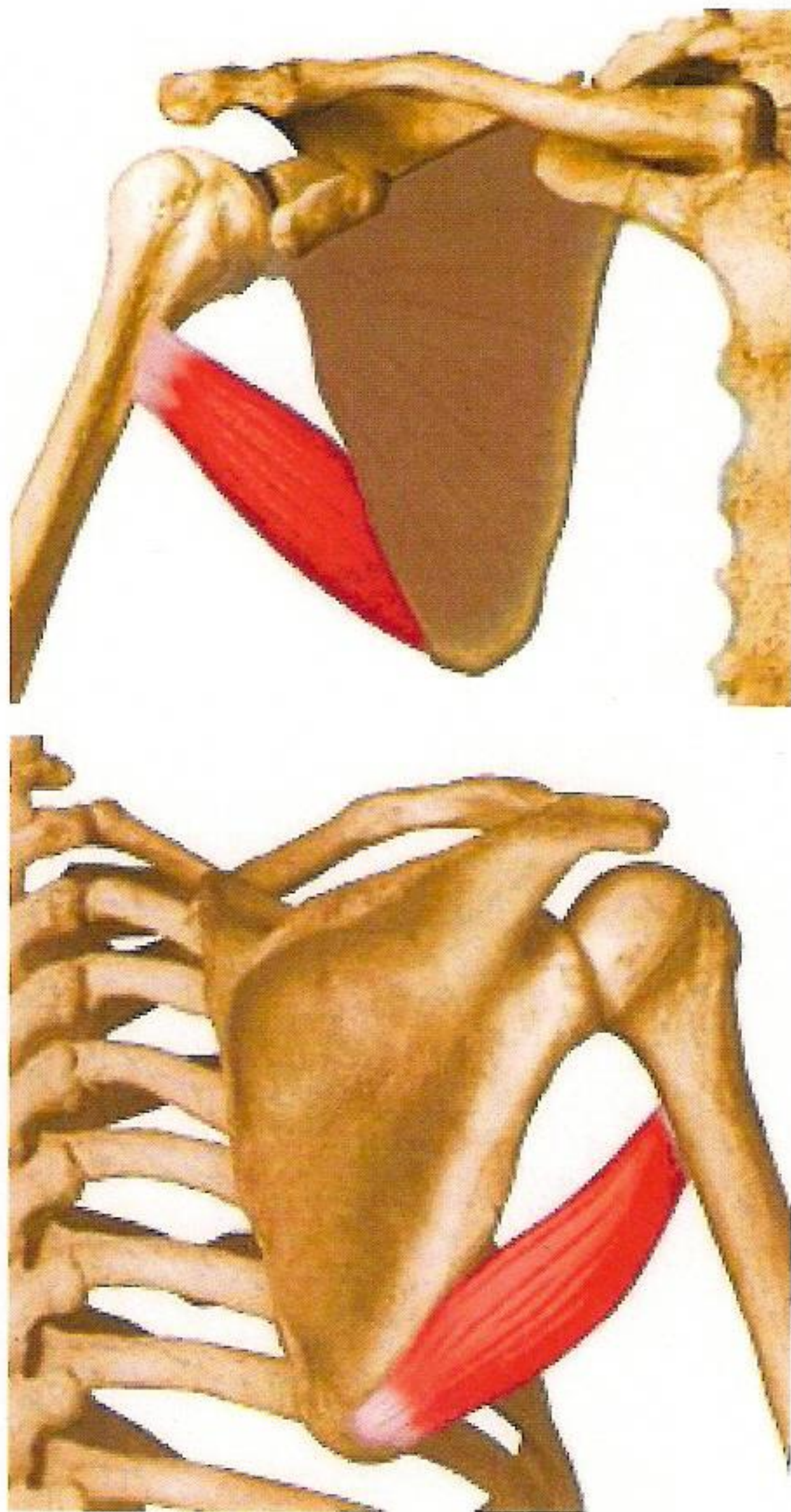
Origin:- From the lower part of ligamentum nuchae & the spines of the seventh cervical & first thoracic vertebrae

Insertion:- the medial border of scapula opposite root of the spine (against spine)

Nerve supply:- dorsal scapular nerve (C5)

Action:- retraction of the scapula

C- MUSCLES CONNECTING THE SCAPULA TO HUMERUS



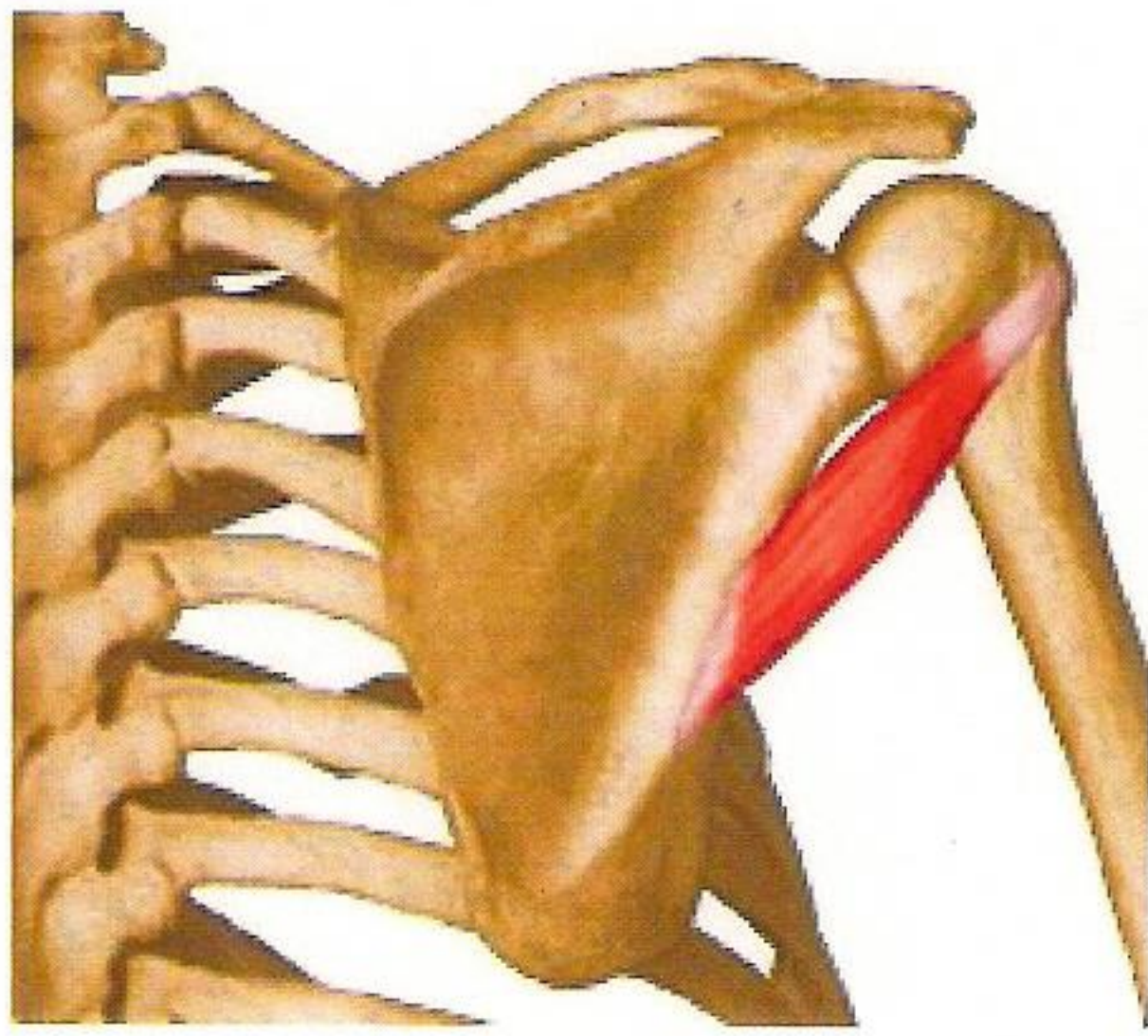
1- Teres major

Origin:- from the lower third of the lateral border of the scapula

Insertion:- the medial lip of bicipital groove of the humerus

Nerve supply:- lower subscapular nerve (C5,6)

Action:- adduction & medial rotation of the arm



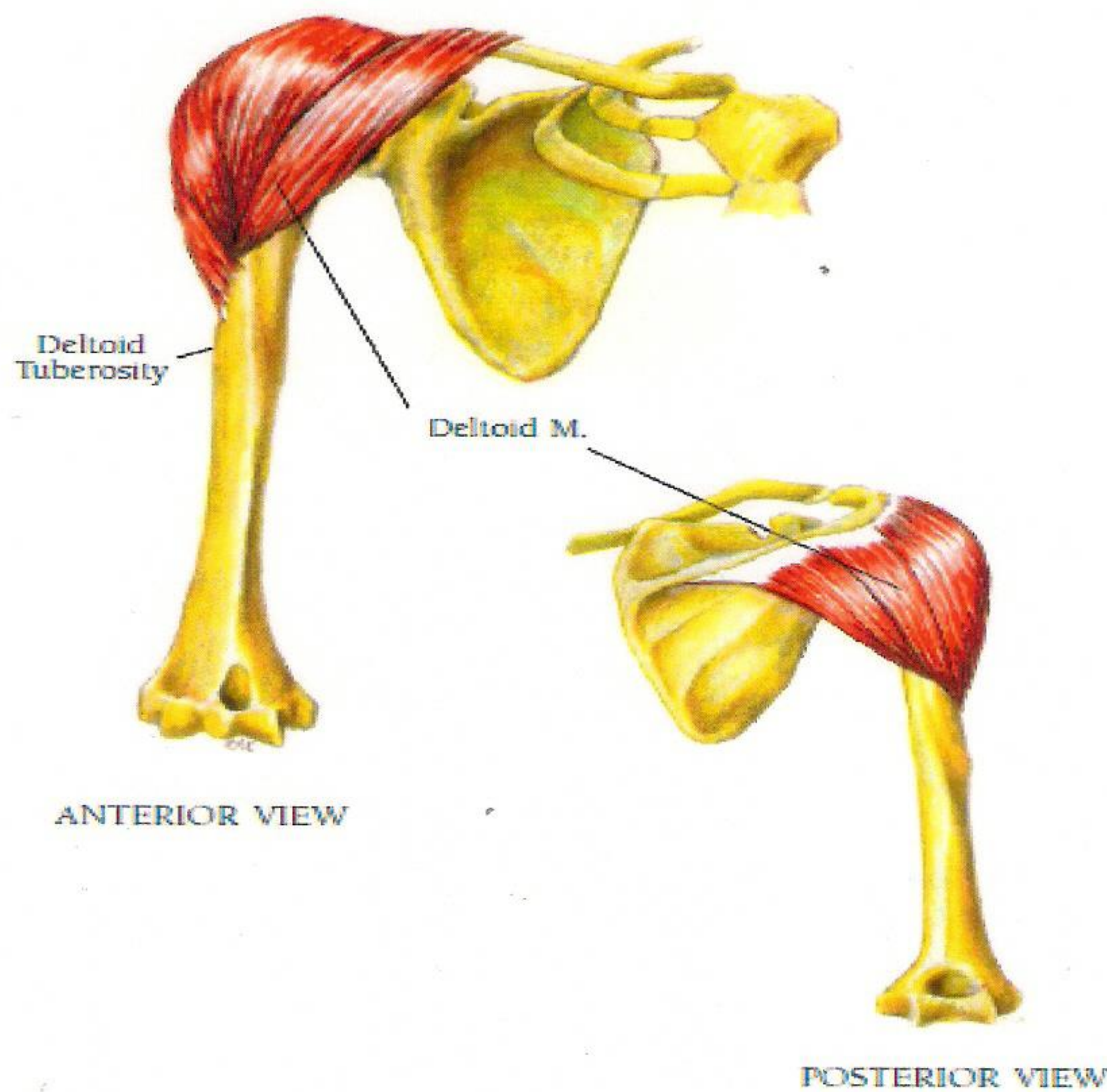
2- Teres minor

Origin:- from the upper two thirds of the lateral border of the scapula

Insertion:- the greater tuberosity of the humerus(the lower facet)

Nerve supply:- axillary nerve (C5,6)

Action:- adduction and lateral rotation of arm & stabilization of shoulder joint



3- Deltoid

Origin:-

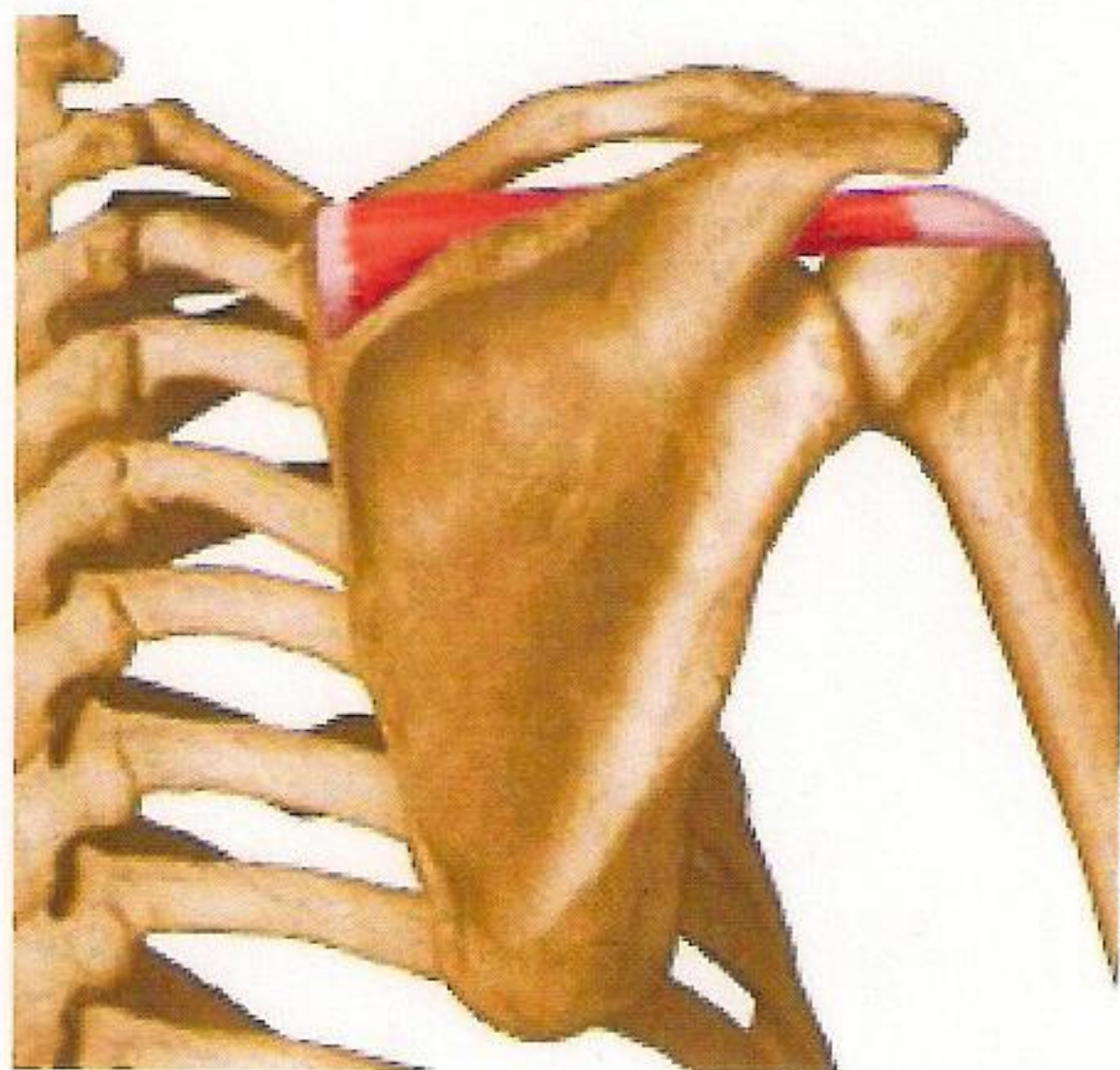
- anterior fibers :- from the lateral third of the anterior border of clavicle
- middle fibers:- from the lateral border of the acromion
- Posterior fibers :- from the lower border of spine of scapula

Insertion :- deltoid tuberosity of the humerus

Nerve supply :- axillary nerve (C5,6)

Action:-

- anterior part:-flexion & medial rotation of the arm at the shoulder joint
- middle part:-abduction of arm from 15 to 90
- posterior part:- extension & lateral rotation of arm at shoulder joint



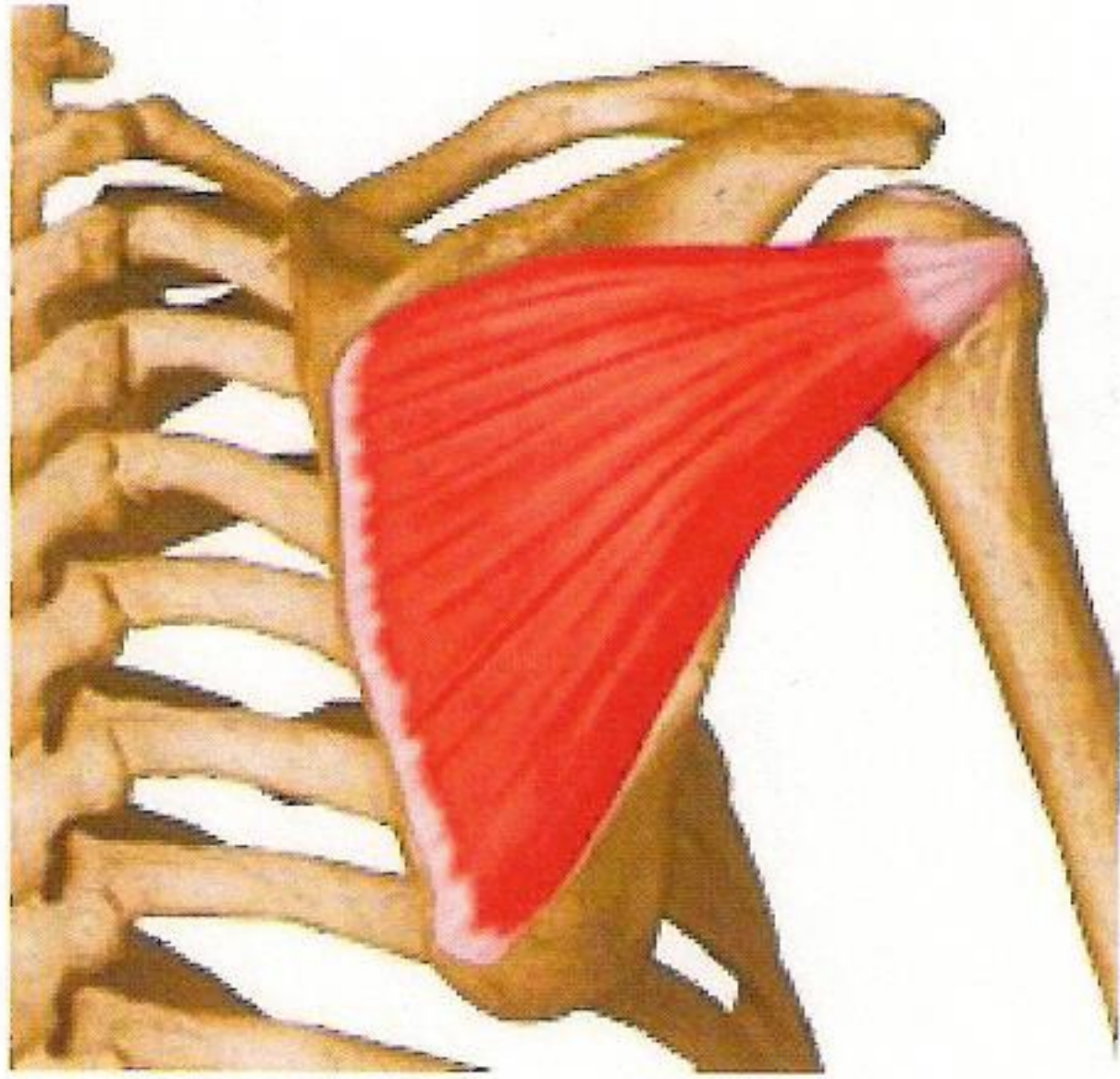
4- Supraspinatus

Origin:- from the supraspinous fossa of the scapula

Insertion:- the greater tuberosity of the humerus (the medial facet)

Nerve supply:- suprascapular nerve (C5,6)

Action:- abduction of the arm from 0 to 15 & stabilize shoulder joint



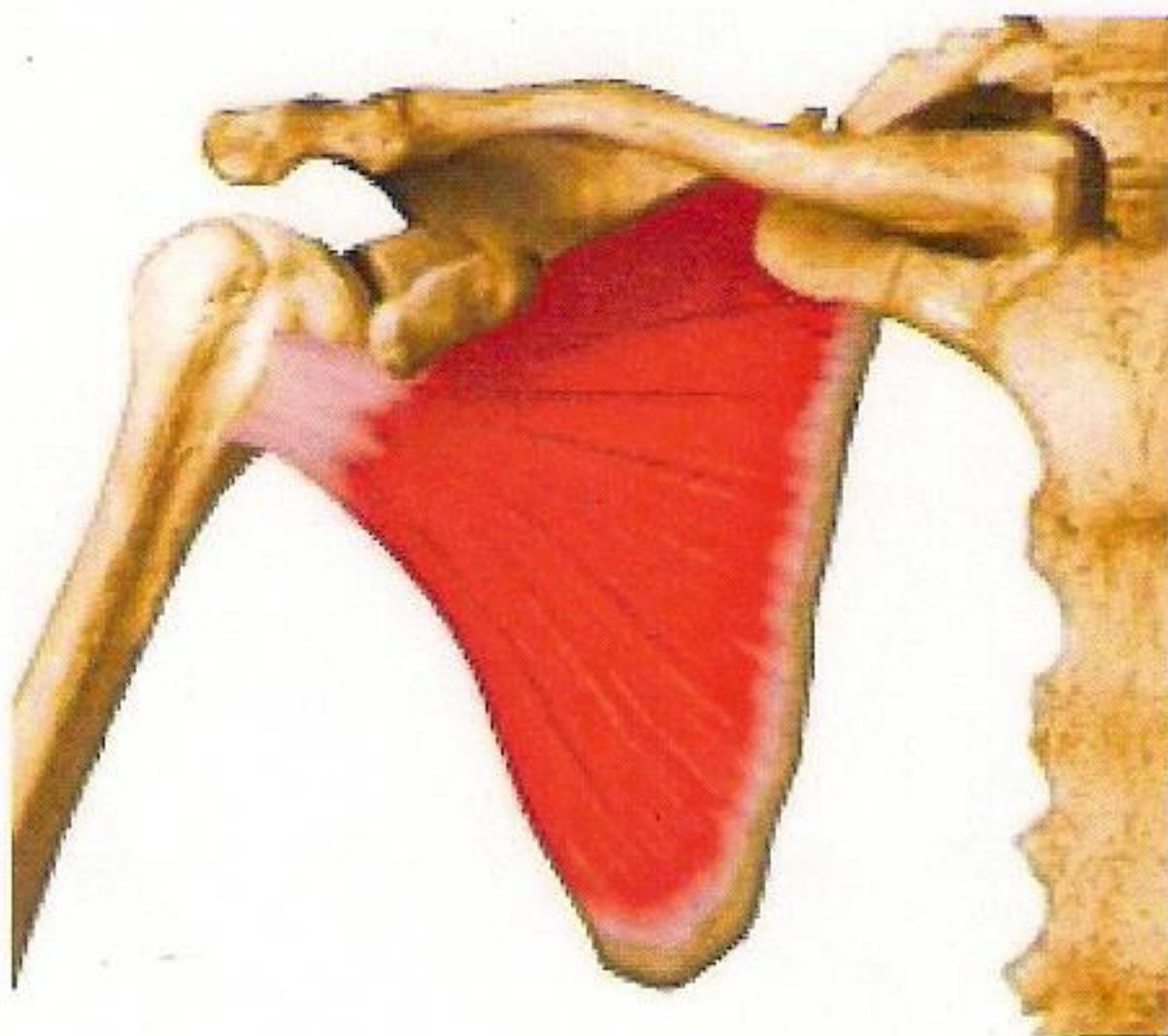
5- Infraspinatus

Origin:- from the infraspinous fossa of the scapula

Insertion :- the lower facet of the greater tuberosity of the humerus

Nerve supply :- suprascapular nerve (C5,6)

Action :- adduction and lateral rotation of arm & stabilize shoulder joint



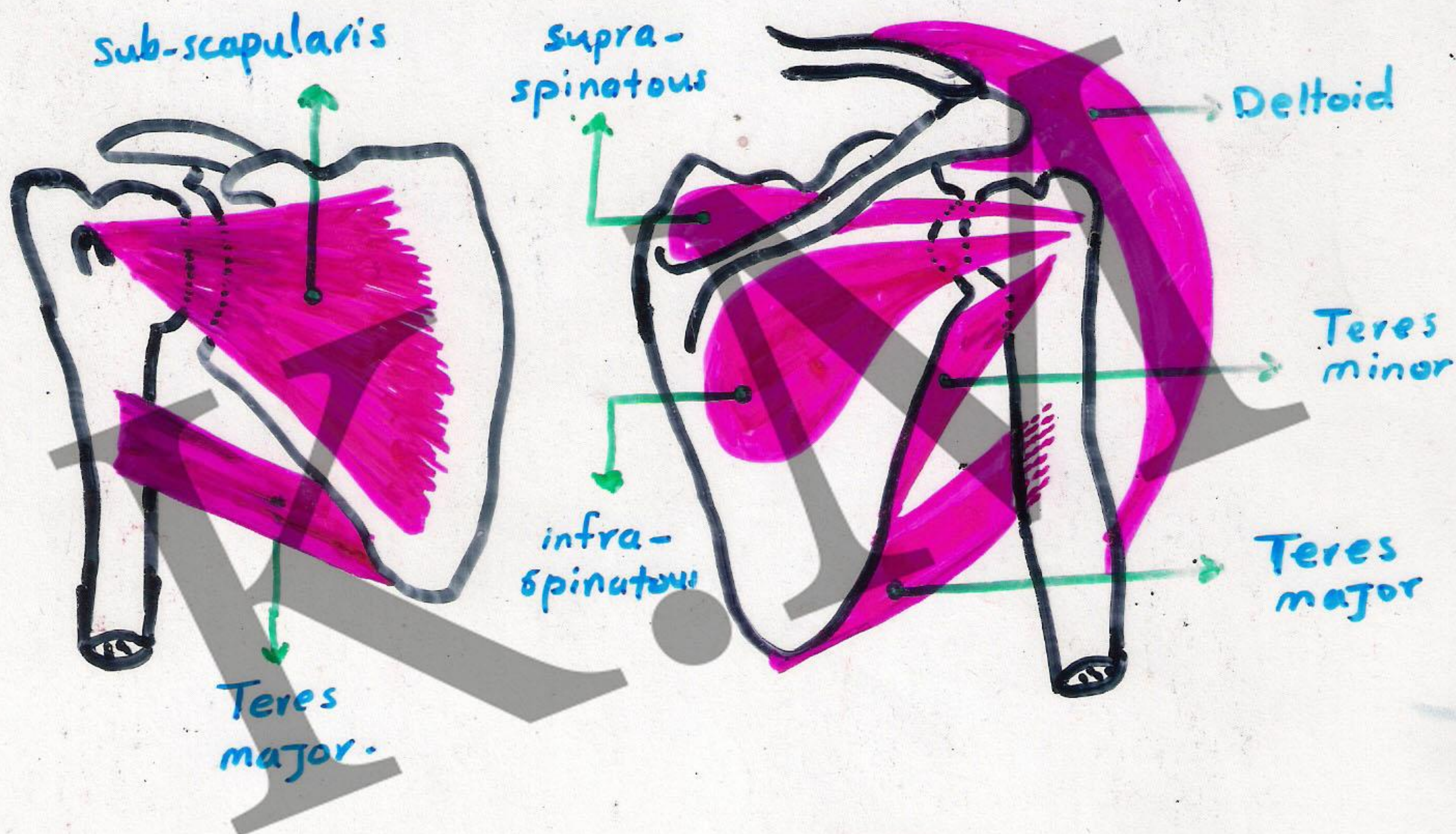
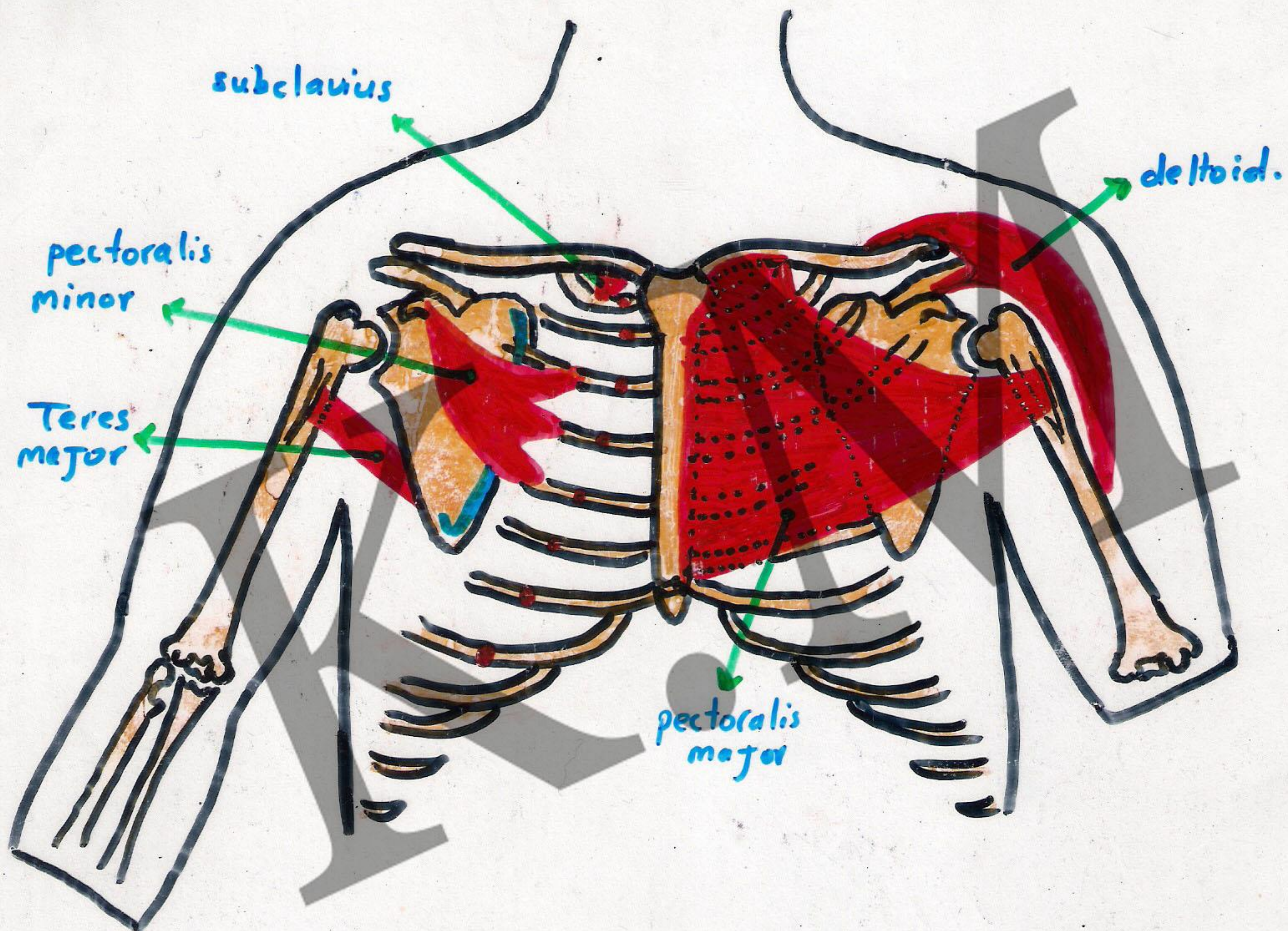
6- Subscapularis

Origin:- from the medial two thirds of subscapular fossa

Insertion:- lesser tuberosity of the humerus

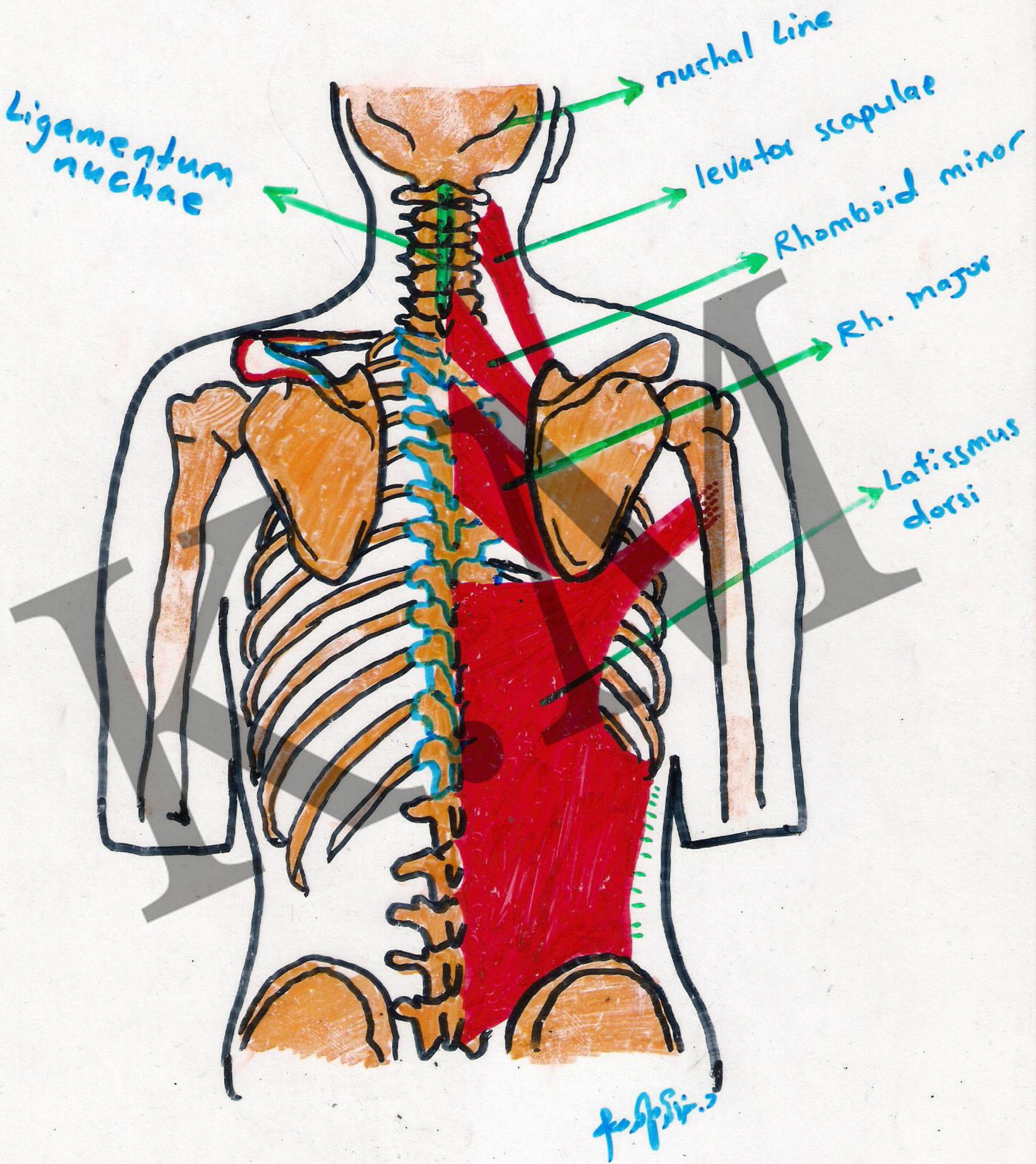
Nerve supply:- upper and lower subscapular nerve (C5,6)

Action:- adduction & medial rotation of the arm & stabilize shoulder joint



- FRONT -

- BACK -



MUSCLES OF ARM (ANTERIOR COMPARTMENT)



1- Biceps brachii

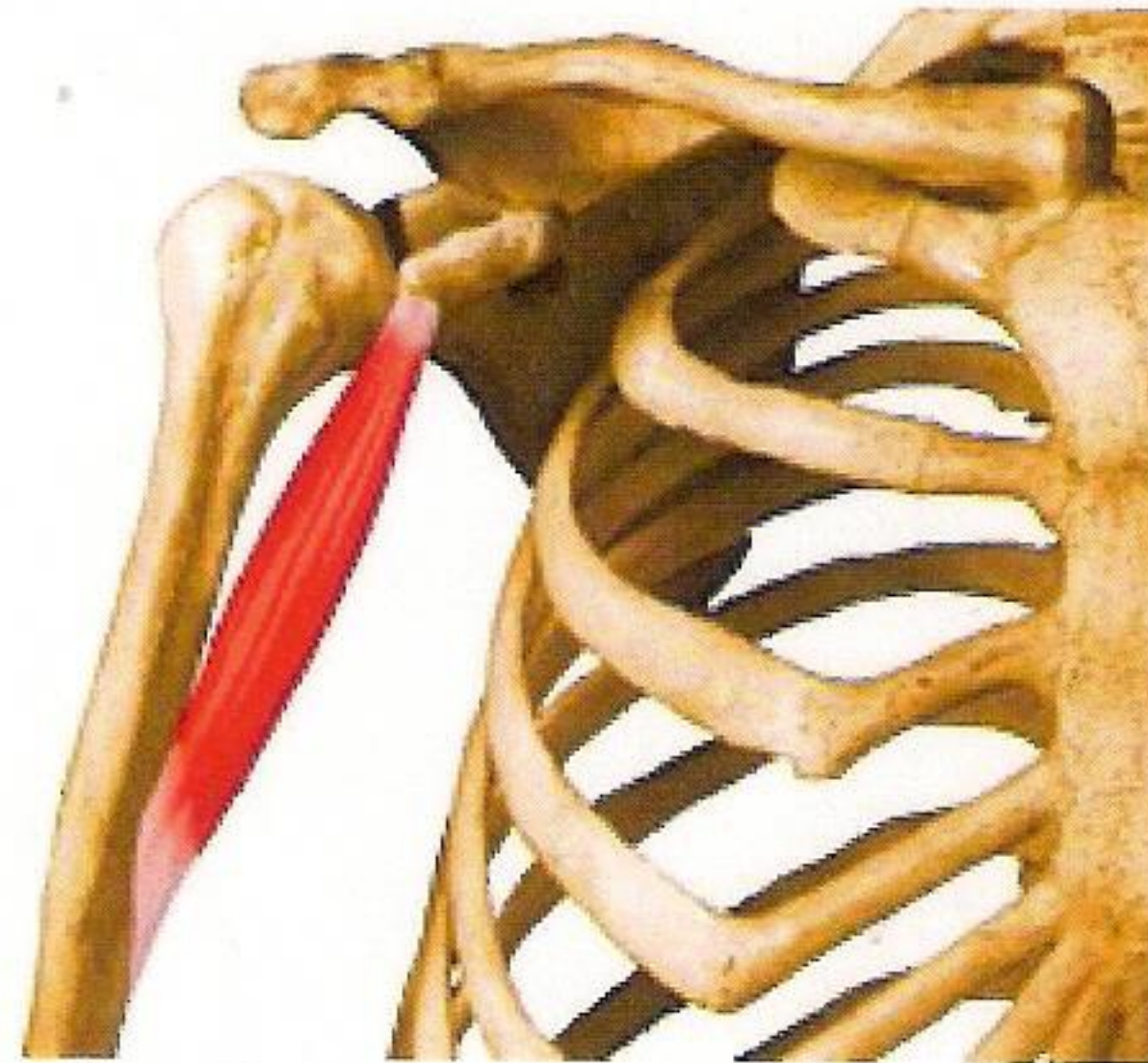
Origin:- Long head:- from the supraglenoid tubercle of the scapula

Short head:- from the tip of the coracoid process of the scapula

Insertion:- the radial tuberosity (posterior part) and by aponeurosis into the deep fascia

Nerve supply:- musculocutaneous nerve (C5,6,7)

Action:- strong supinator of the forearm and flexor of the elbow joint and weak flexor of the shoulder joint



2- Brachialis

Origin:- from the front of the lower half of the humerus

Insertion:- the anterior surface of the coronoid process of the ulna

Nerve supply:- musculocutaneous nerve (C5,6,7) & radial nerve

Action:- strong flexor of the elbow joint

3- Coracobrachialis

Origin:- from the tip of the coracoid process

Insertion:- the middle of the medial side of the shaft of the humerus

Nerve supply:- musculocutaneous nerve (C5,6,7)

Action:- flexion the arm & weak adduction

MUSCLES OF ARM (POSTERIOR COMPARTMENT)



Triceps

Origin:- Long head:- from the infraglenoid tubercle of the scapula

Lateral head:- from posterior aspect of shaft of humerus (above
Spiral groove)

Medial head:- from posterior aspect of shaft of humerus (below
Spiral groove)

Insertion:- Olecranon process of ulna

Nerve supply:- Radial nerve

Action:- extension of elbow (and by long head extension of shoulder)

Short head

Long head

belly

tendon

Coraco-brachialis

Brachialis

Biceps

Brachialis

infra-glenoid tubercle

Lat head

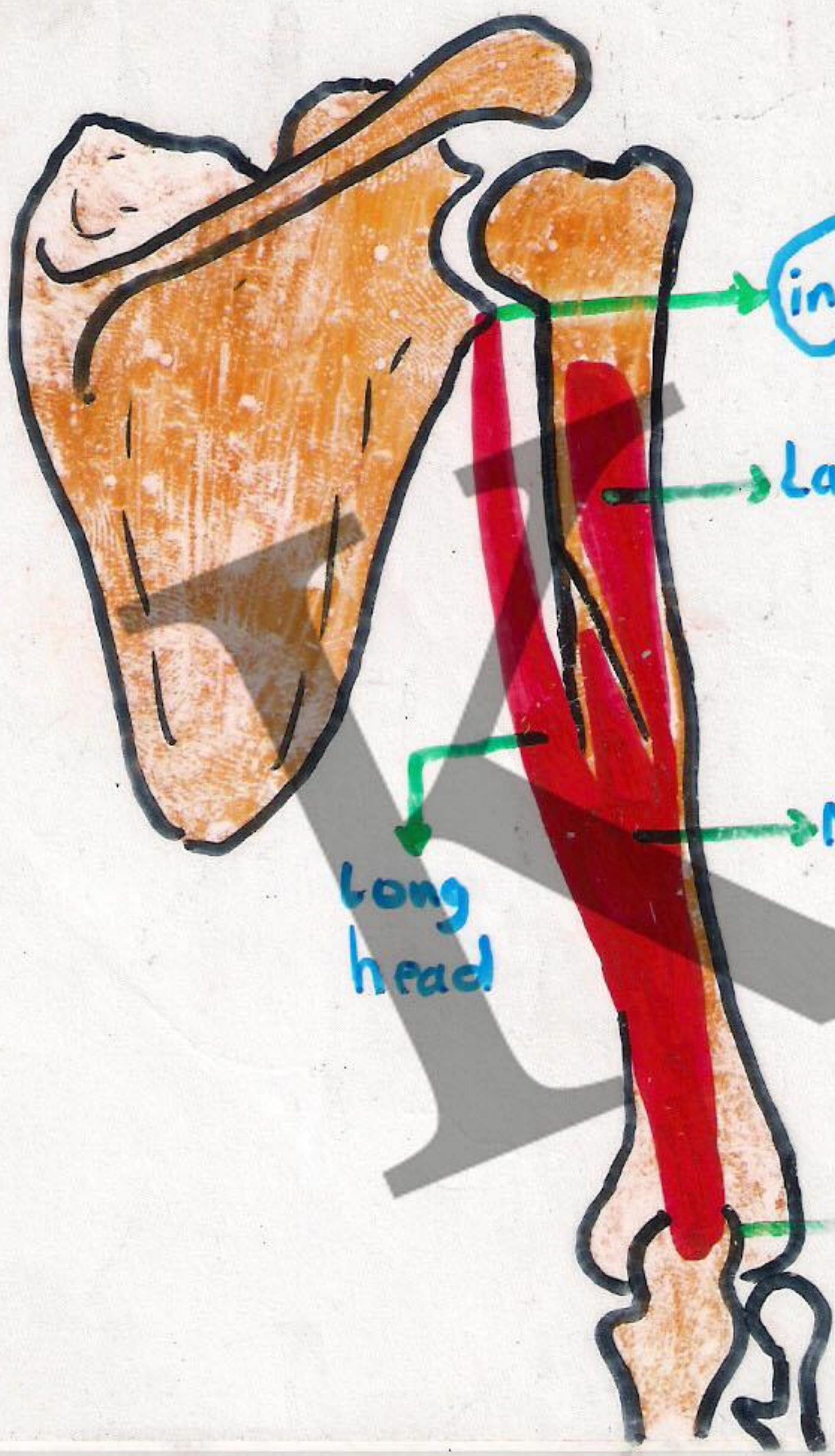
Med. head

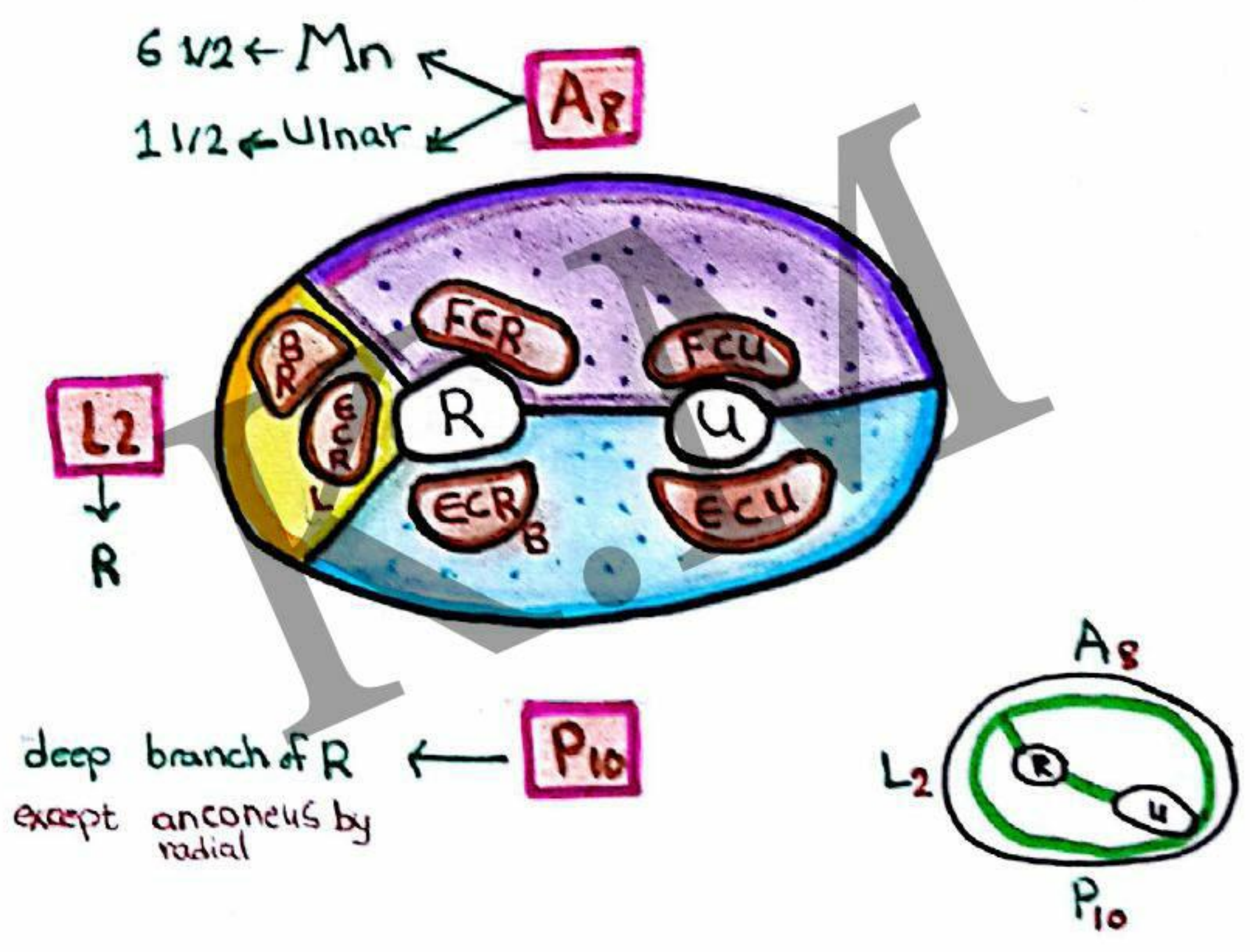
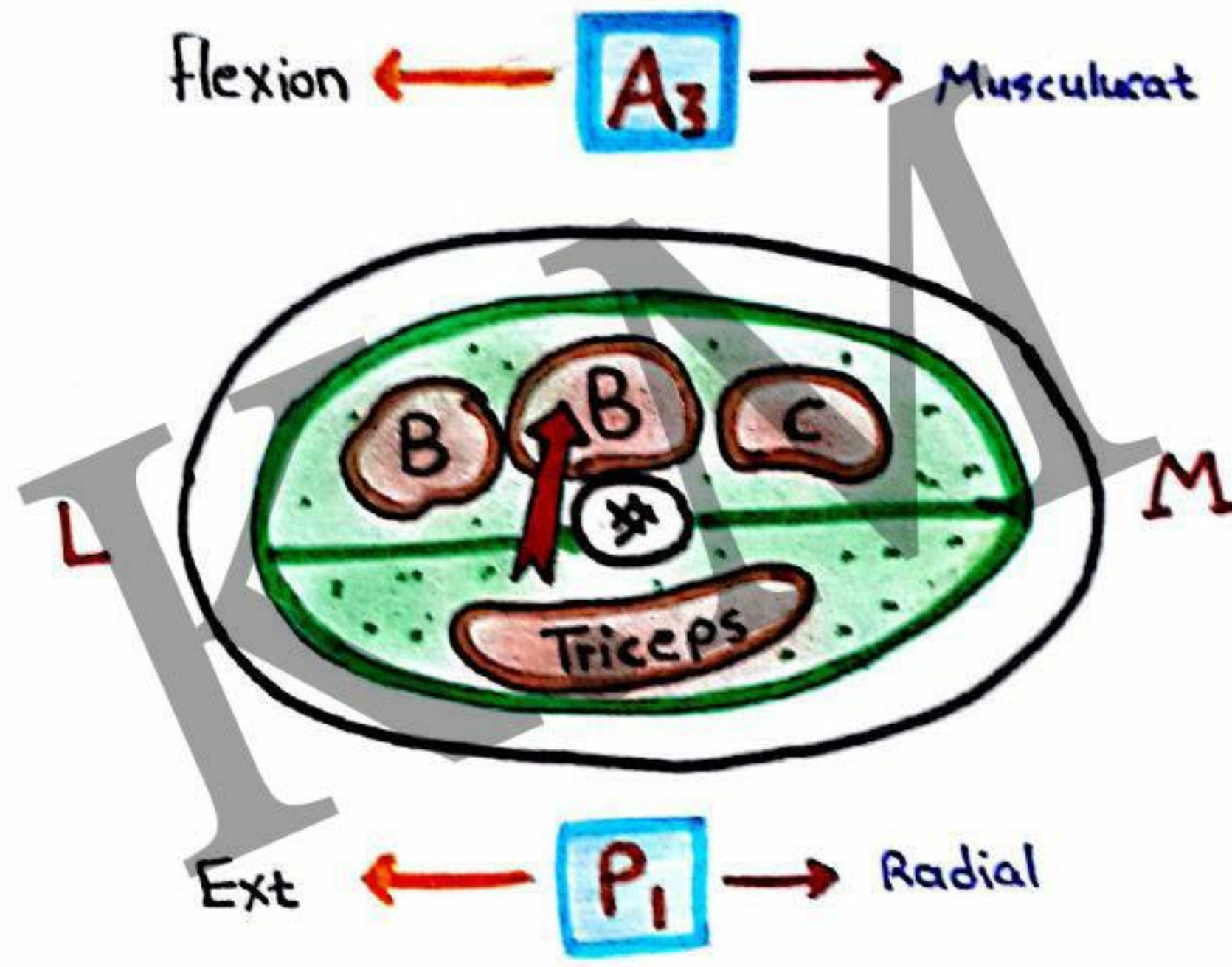
Long head

olecranon process

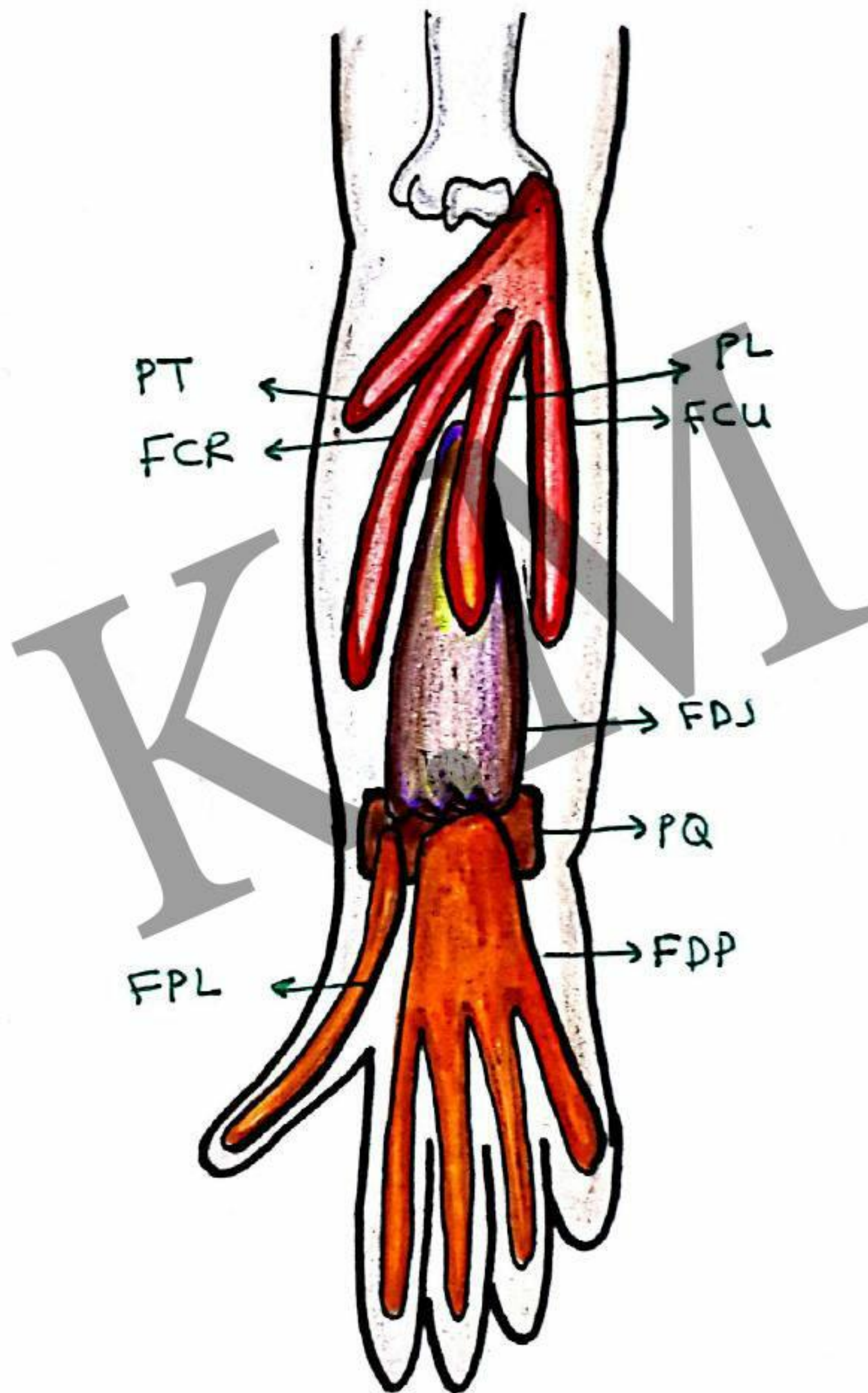
subsp.?

Med head Lat head

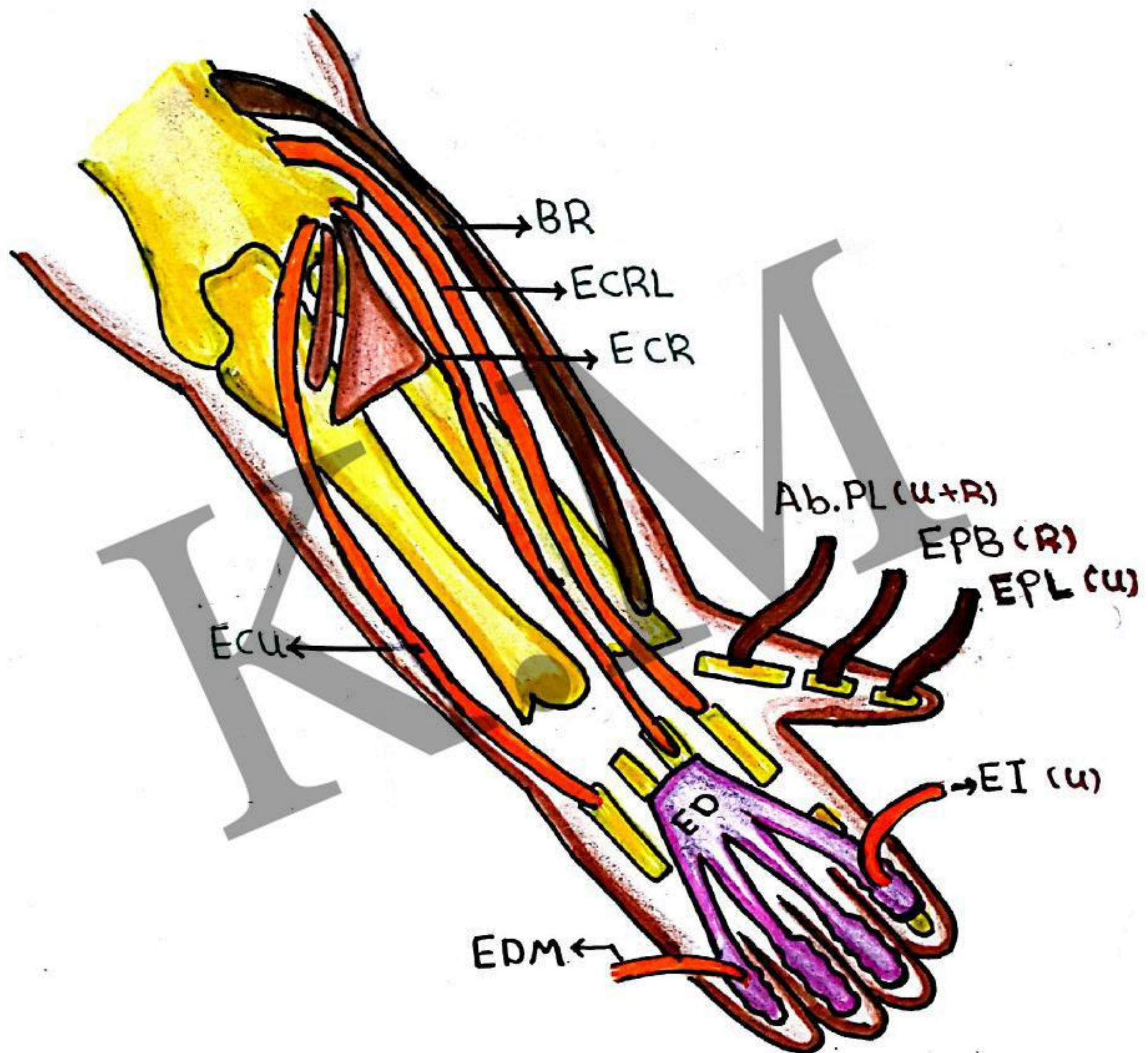




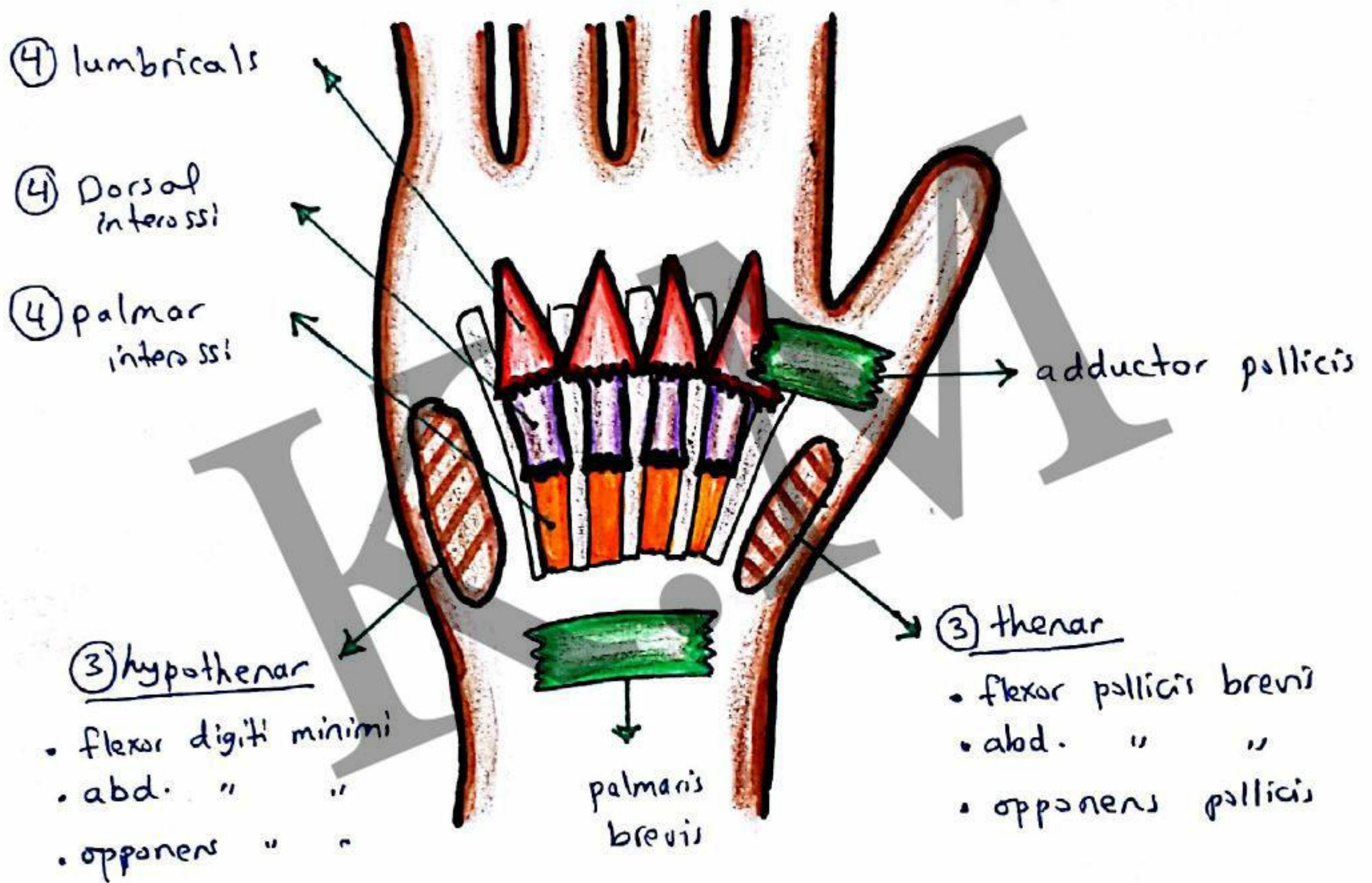
ant. comp. forearm.



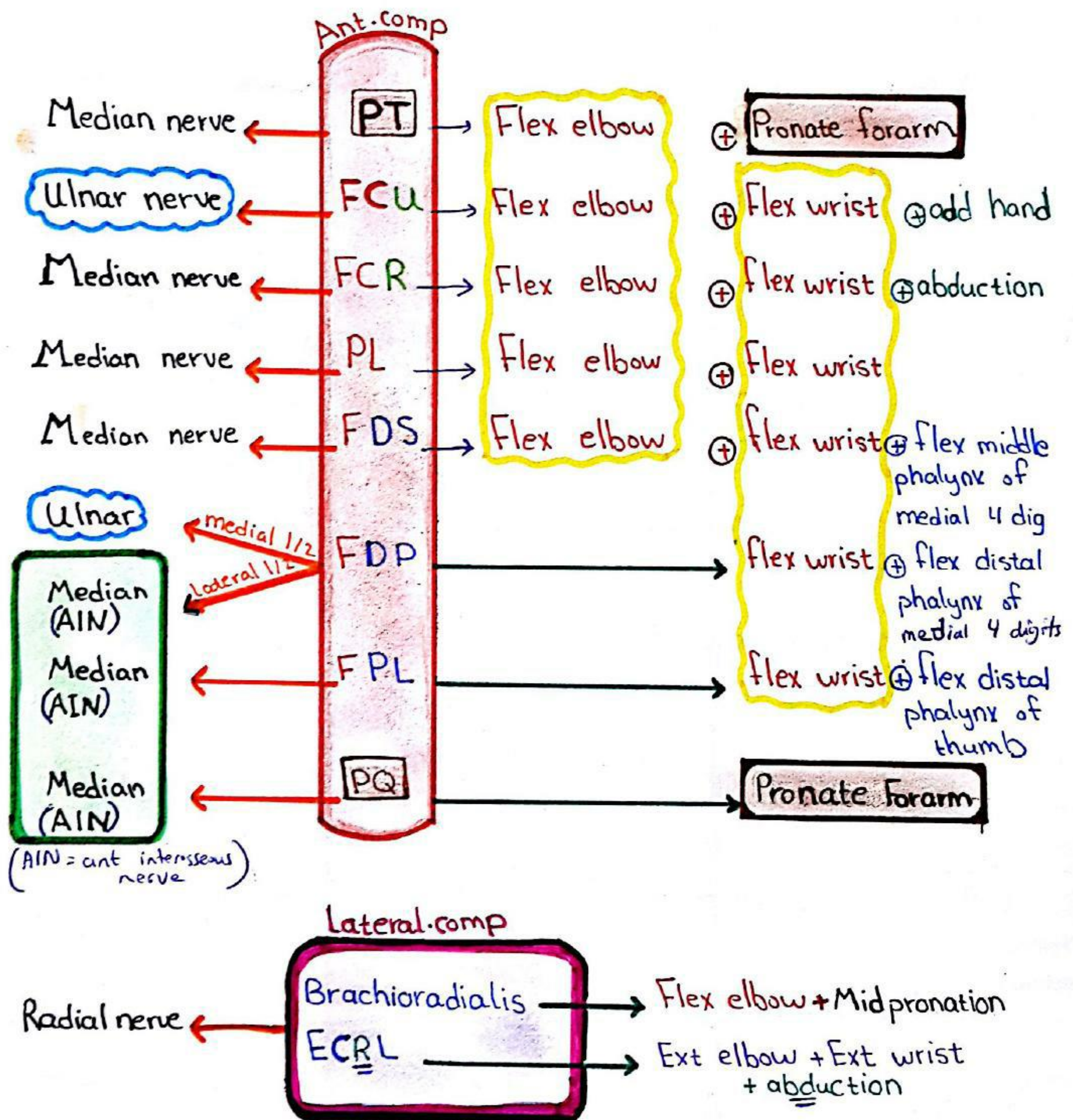
Post & Lat comp of forearm



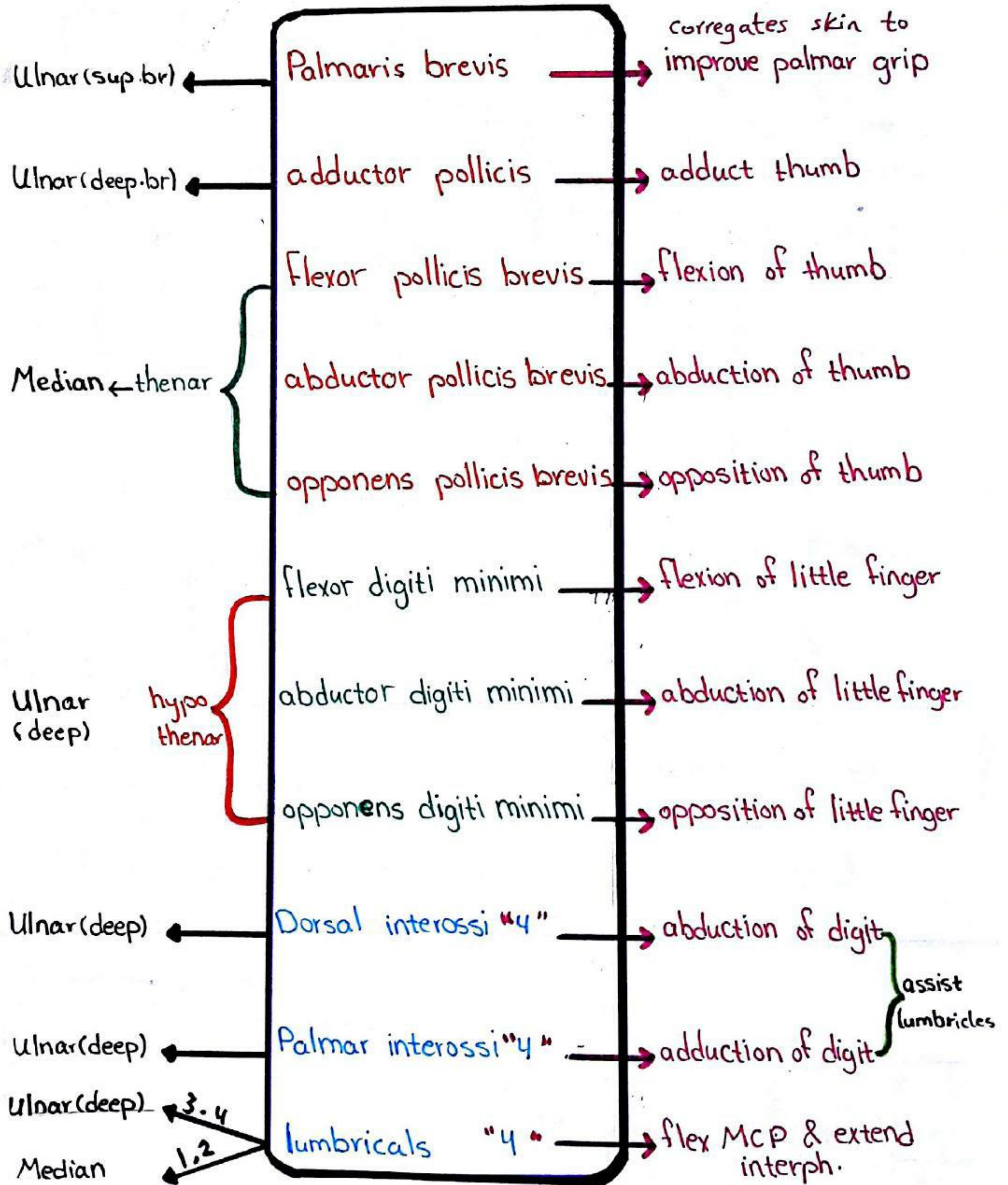
Ms of hand



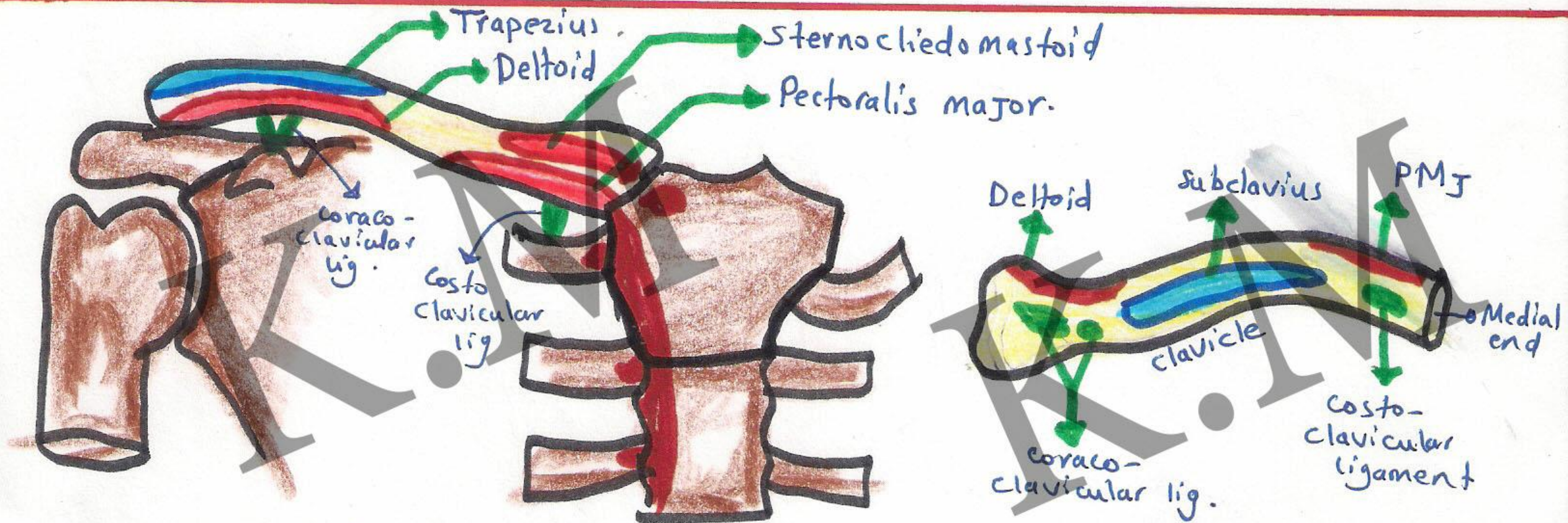
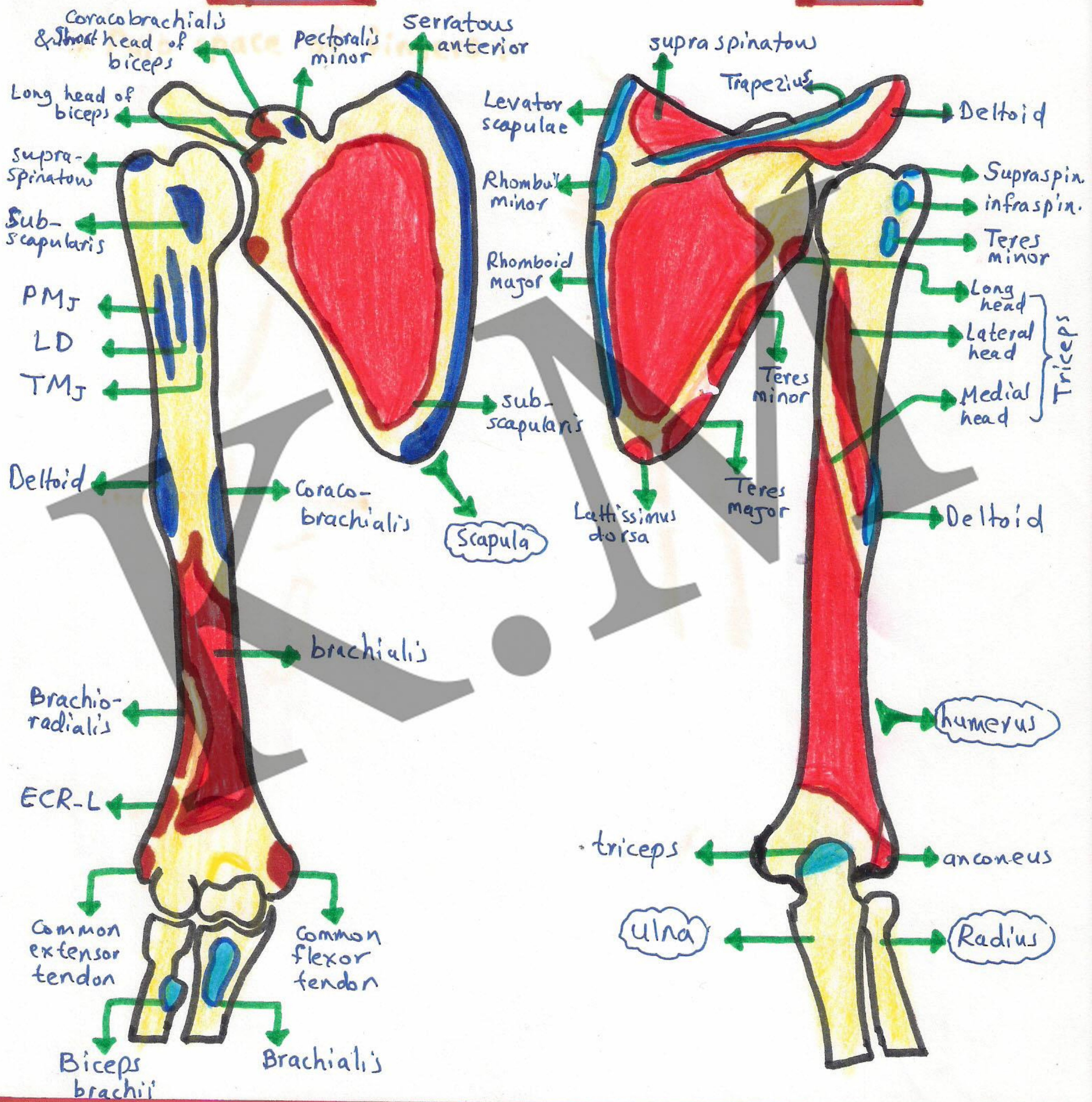
Ms of forearm ant & lat. comp. (Ns & action)

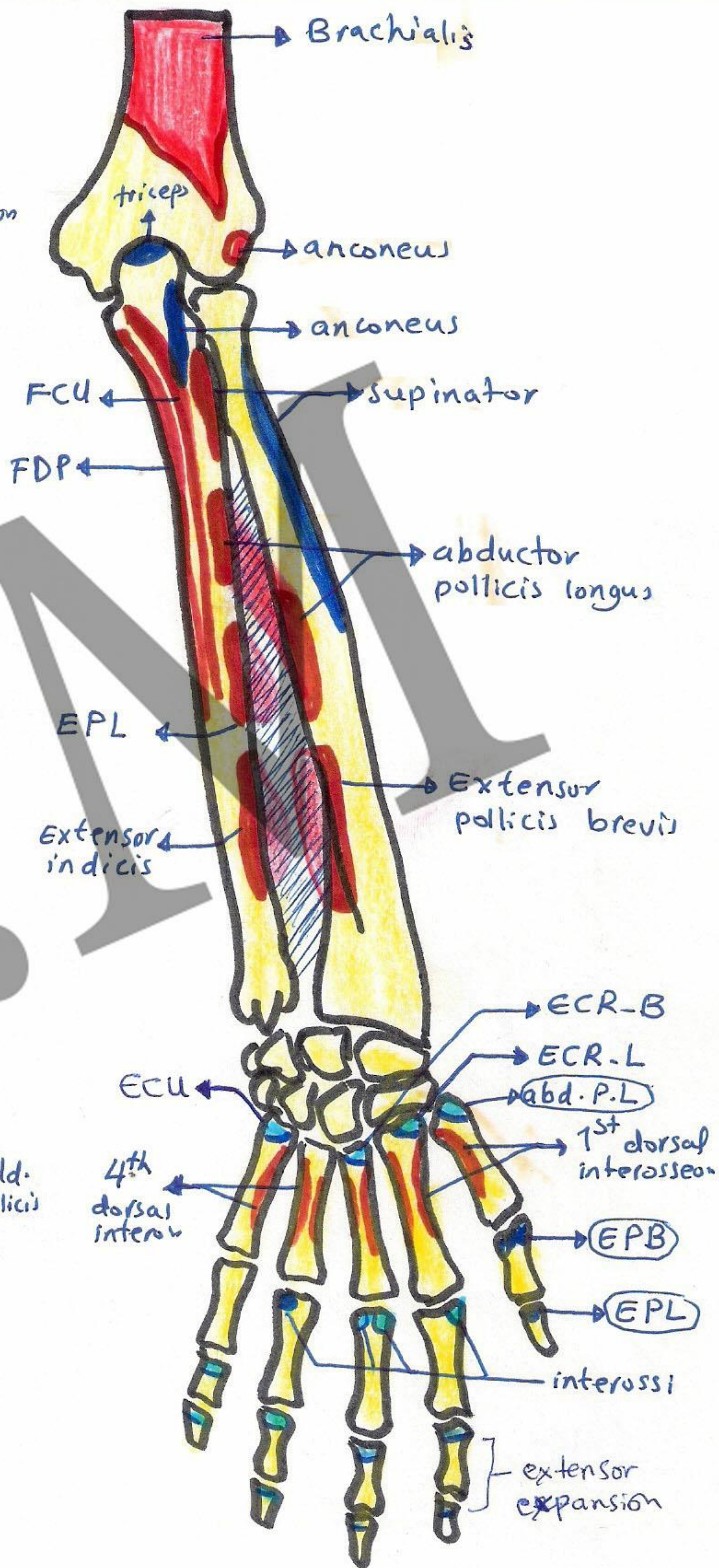
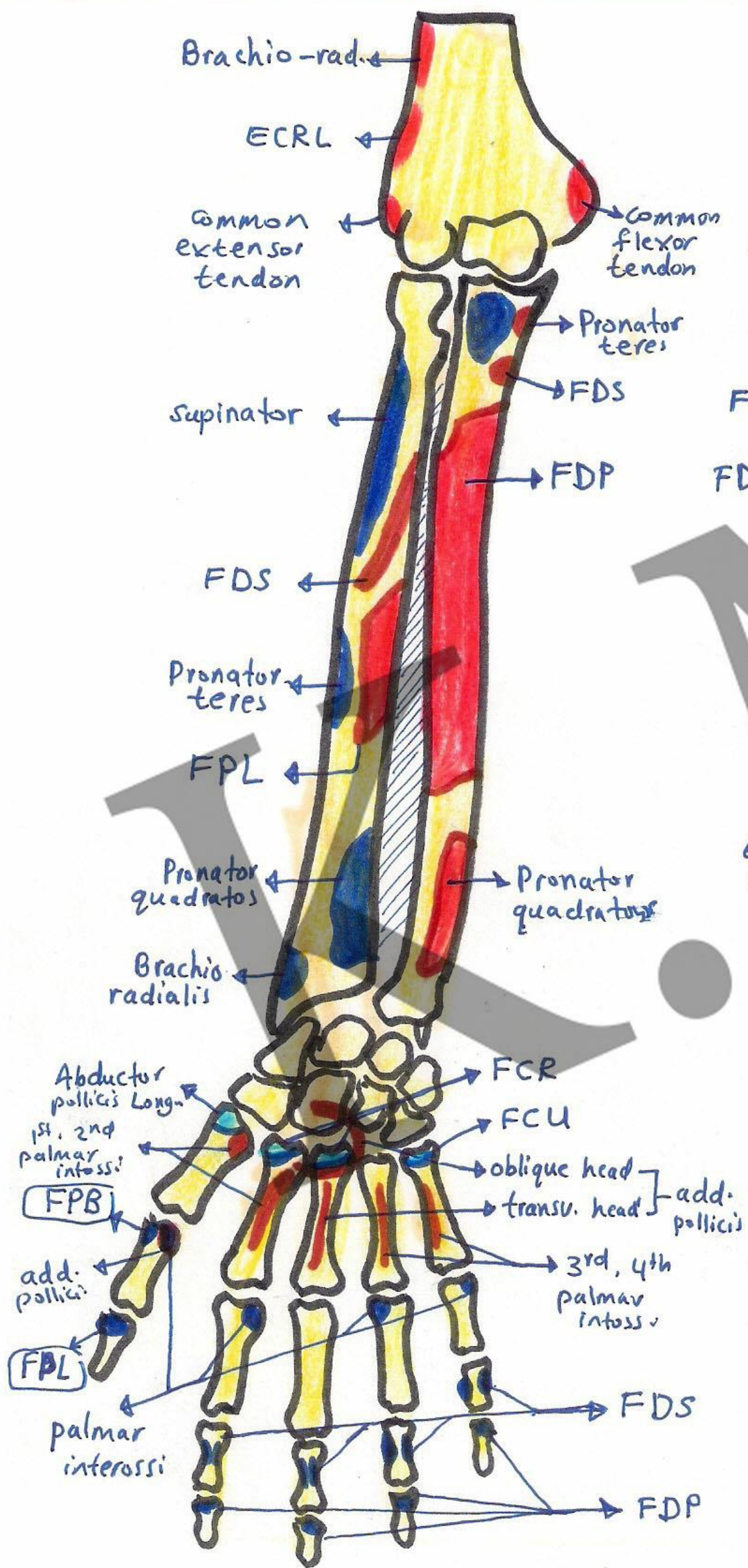


Ms of hand. N/S & action



BONES OF UPPER LIMB.





NERVE LESIONS IN THE UPPER LIMB - 1

BRACHIAL PLEXUS - UPPER C5,6

AETIOLOGY: Birth traction (Erb Duchenne palsy) or adult trauma (Erb's palsy) eg motorbike accident

MUSCLE LOSS: Deltoid, short shoulder muscles, brachialis, biceps, supinator, brachioradialis

MOVEMENT LOSS: Abduction, external rotation of shoulder, supination, elbow flexion

DOMINATED BY: Latissimus dorsi (C6,7,8), pronator teres (C6,7), pectorals (C6,7,8)

RESULT: Atrophy, limpness of upper arm, internal rotation of shoulder, pronation of forearm, palm backwards - 'hinting for tip'

SENSORY LOSS: Upper and lower lateral cutaneous nerve of arm from axillary and radial but only if C6 is involved, lateral cutaneous nerve of forearm (musculocutaneous)

SUMMARY: C5 controls shoulder flexion, abduction, lateral rotation and elbow flexion
C6 controls supination including supinator



ERB'S PALSY

NERVE LESIONS IN THE UPPER LIMB - 2

BRACHIAL PLEXUS - LOWER T1

KLUMPKE'S PALSY

AETIOLOGY: Pull on arm at breech delivery or apical carcinoma of lung

MUSCLE LOSS: Small muscles of hand - lumbricals and interossei

MOVEMENT LOSS: Flexion at metacarpophalangeal joints & diminished extension at interphalangeal joints

DOMINATED BY: Long extensors acting on metacarpophalangeal joints
Long flexors acting on interphalangeal joints

RESULT: Clawed hand ('main en griffe') with or without Horner's syndrome (ptosis/small pupil) if there is damage to sympathetic chain

SENSORY LOSS: T1 distribution - lower (+or- upper) inner arm & hand

TEST: Loss of bulk of 1st dorsal interosseous, inability to hold paper between outstretched fingers

NOTE: If C8 & T1 are involved, as with a cervical rib, there is weakness of small muscles & paraesthesia along ulnar border of arm & hand



CLAWED HAND

NERVE LESIONS IN THE UPPER LIMB - 3

RADIAL IN AXILLA

AETIOLOGY: Crutch pressure, fracture of humerus

MUSCLE LOSS: Triceps, extensors of wrist and fingers

MOVEMENT LOSS: Extensor weakness at elbow, wrist, metacarpophalangeal joints. Interphalangeal joints are alright because of intact interossei & lumbricals

RESULT: Wrist drop and inability to grip

SENSORY LOSS: Over 1st dorsal interosseous, +/- lower lateral cutaneous nerve of arm

TEST: Sensation as above. Power of brachioradialis, wrist extension & extension of elbow against resistance



WRIST
DROP

NERVE LESIONS IN THE UPPER LIMB - 4

RADIAL IN SPIRAL GROOVE

AETIOLOGY: Fracture mid shaft humerus, Saturday night palsy, injections

MUSCLE LOSS: Extensors of wrist and fingers, but triceps & anconeus are spared

MOVEMENT LOSS: Extensor weakness wrist, metacarpophalangeal joints. Interphalangeal joints are alright because of intact interossei & lumbricals

RESULT: Wrist drop and inability to grip. Extension of elbow is alright

SENSORY LOSS: Over 1st dorsal interosseous, lower lateral cutaneous nerve of arm is usually alright

TEST: Power of wrist extension



WRIST
DROP

NERVE LESIONS IN THE UPPER LIMB - 5

RADIAL (POSTERIOR INTEROSSEOUS) IN FOREARM

AETIOLOGY: Trauma, surgical mishap, fracture/dislocation of radial head

MUSCLE LOSS: Extensors of wrist and fingers, but extensor carpi radialis longus is spared

MOVEMENT LOSS: Extensor weakness of metacarpophalangeal joints. Interphalangeal joints are alright because of intact interossei & lumbricals. NO wrist drop & grip is alright as extensor carpi radialis longus is intact

RESULT: No wrist drop & grip alright. Extension of elbow is alright

SENSORY LOSS: No sensory loss if superficial radial alright

TEST: Power of extension of metacarpophalangeal joints



NO
WRIST
DROP

NERVE LESIONS IN THE UPPER LIMB - 6

ULNAR AT ELBOW

AETIOLOGY: Fracture/dislocation of elbow, damage behind medial epicondyle

MUSCLE LOSS: All intrinsic muscle of hand except radial 2 lumbricals, 4th & 5th slips of flexor digitorum profundus, flexor carpi ulnaris

RESULT: Clawing & loss of grip between fingers (see T1 lesion in brachial plexus) BUT less clawing of index & middle fingers because of intact lumbricals and less clawing than in a wrist injury of ring & little fingers because of loss of flexor digitorum profundus to these fingers. Also there is radial deviation

SENSORY LOSS: Ulnar side of hand and ulnar 1 1/2 fingers

TEST: Place paper between straight fingers. Try abducting fingers. Test sensation of 5th finger pulp. Froment's sign (see separate illustration). Wasting of 1st dorsal interosseous. Test distal interphalangeal joint of little finger for ulnar 1/2 of profundus



CLAWED
HAND

NERVE LESIONS IN THE UPPER LIMB - 7

ULNAR AT WRIST

AETIOLOGY: Lacerations

MUSCLE LOSS: All intrinsic muscle of hand except radial 2 lumbricals, (NOT flexor digitorum profundus, NOT flexor carpi ulnaris)

RESULT: Clawed hand (no interossei therefore no flexion of metacarpophalangeal joints but instead they are extended by long extensors. There is flexion of interphalangeal joints by long flexors. No radial deviation. Note: LESS clawing of index & middle fingers because of intact median nerve to radial lumbricals but MORE clawing of ring & little fingers because of intact 1/2 flexor digitorum profundus than for an ulnar lesion at elbow

SENSORY LOSS: Ulnar 1 1/2 fingers. Dorsal & palmar cutaneous branches may be spared

TEST: Place paper between straight fingers. Try abducting fingers. Test sensation of 5th finger pulp. Froment's sign (see separate illustration). Wasting of 1st dorsal interosseous.

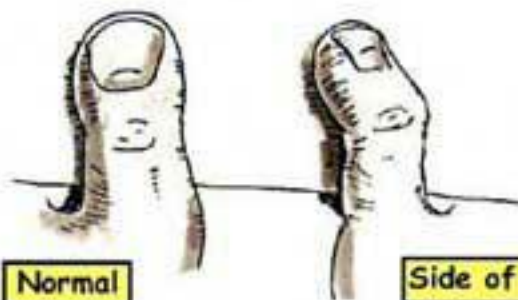
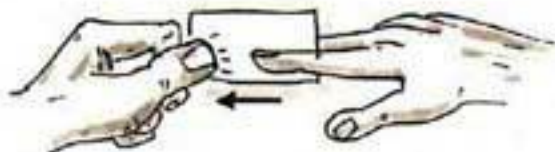
CLAWED HAND



NERVE LESIONS IN THE UPPER LIMB - 8

ULNAR

TESTING FOR WEAKNESS OF INTEROSSEI - T1



FROMENT'S SIGN

Paper is pinched in the first web space between proximal phalanx of thumb and metacarpophalangeal joint of the index finger with the wrist in a neutral position. The metacarpophalangeal joints are extended and the thumb nail faces the patient to avoid trick movements. The side with the loss of adductor pollicis compensates by using flexor pollicis longus which flexes the distal interphalangeal joint of the thumb

NERVE LESIONS IN THE UPPER LIMB - 9

MEDIAN NERVE - SUPRACONDYLAR

AETIOLOGY: Supracondylar fracture/dislocation, tight bicipital aponeurosis, ligament of Struthers

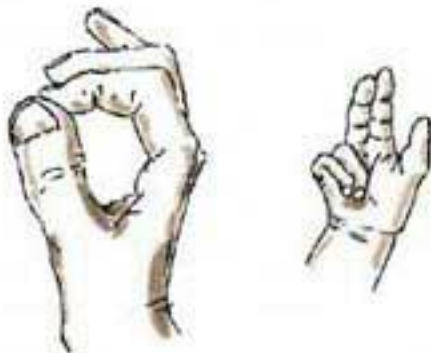
MUSCLE LOSS: Pronator teres, flexors of wrist/fingers except half flexor digitorum profundus & flexor carpi ulnaris. Thenar muscles except adductor pollicis & 2 radial lumbricals

MOVEMENT LOSS: Loss of pronation, weak wrist flexion & abduction. No abduction or opposition of thumb and, as flexor pollicis is also lost, the thumb is useless. Long flexor tendons (flexors digitorum superficialis & profundus) to index & middle fingers lost

RESULT: Ulnar deviation of wrist, thenar wasting, Papal benediction on flexing fingers (see below)

SENSORY LOSS: Radial side of palm, fingers and nail beds of 3 1/2 fingers

TEST: Sensory - loss of pulp of index finger. Motor - Pronation, Abductor pollicis brevis (+ or - opposition), both interphalangeal joints of index finger and flexor pollicis longus by touching tip of thumb pulp to pulp of index (see below on left)



Papal benediction

- Thenar wasting
- Ulnar deviation
- Minimal flexion of digits 1-3

NERVE LESIONS IN THE UPPER LIMB - 10

MEDIAN NERVE - AT WRIST

AETIOLOGY: Laceration, carpal tunnel compression

MUSCLE LOSS: Thenar (except adductor pollicis)
2 radial lumbricals

MOVEMENT LOSS: Abduction and opposition of thumb. Flexion alright due to intact flexor pollicis longus

RESULT: Wasting of thenar muscles to give an 'ape' hand. Long flexors intact so no Papal benediction

SENSORY LOSS: Radial 3 1/2 fingers +or- radial palm depending on palmar cutaneous branch

TEST: Sensory - loss of pulp of index finger. Motor - Abductor pollicis brevis (+ or - opposition). Interphalangeal joints and pronation all intact

NERVE LESIONS IN THE UPPER LIMB - 11

CARPAL TUNNEL SYNDROME

AETIOLOGY: Anything causing diminution of size of carpal tunnel - inflammation, arthritis, hypothyroidism, idiopathic, tenosynovitis, old fractures. All can lead to compression of median nerve

SITE: Under flexor retinaculum in concavity of carpal bones

RESULT: Paraesthesia/anaesthesia & loss of motor function of thumb, index & middle fingers. BUT preservation of sensation of palm (palmar cutaneous branch of median comes off a few centimetres above carpal tunnel)

TEST: Tapping over carpal tunnel may lead to tingling in median distribution in hand. Sensation should be maintained in the radial side of the palm

NERVE LESIONS IN THE UPPER LIMB - 13

LONG THORACIC NERVE OF BELL-C5,6,7

AETIOLOGY: Damage during surgery in the axilla

RESULT: Loss of serratus anterior leading to 'winging' of scapula.
Decreased flexion and abduction of arm

**SENSORY
LOSS:** Nil

TEST: Patient presses against wall and scapula on side of lesion will
'wing' (stick out backwards)

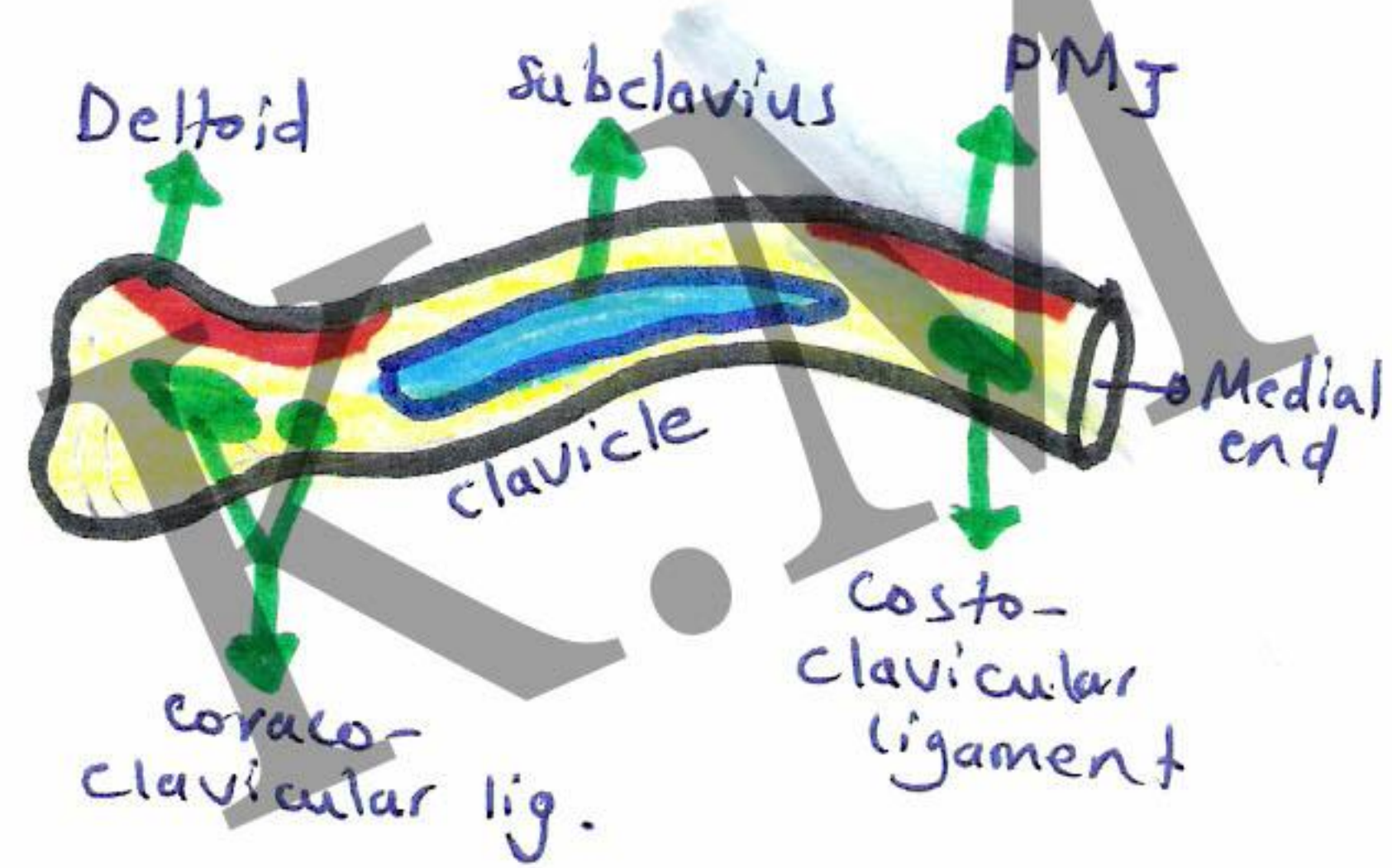
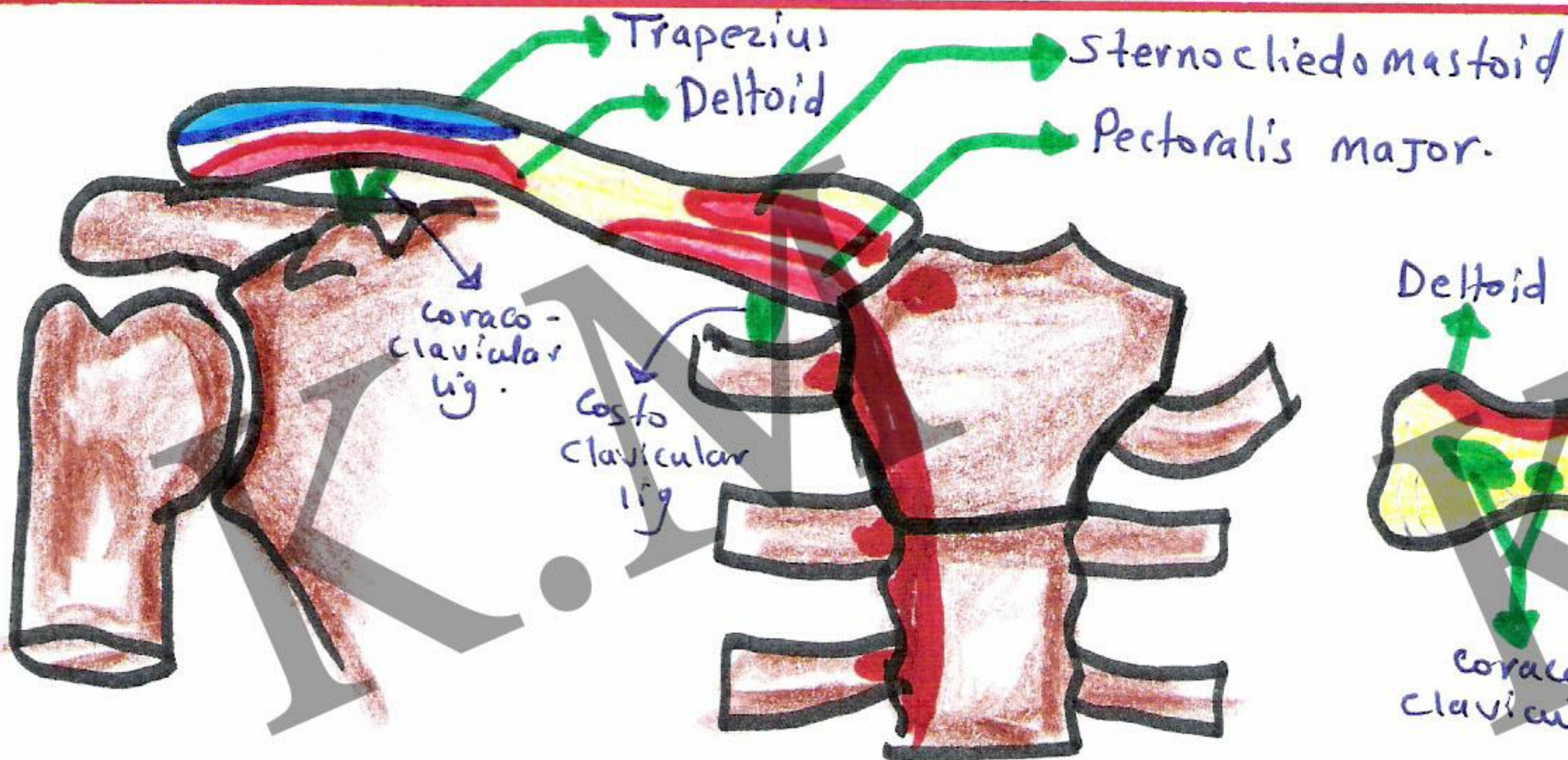
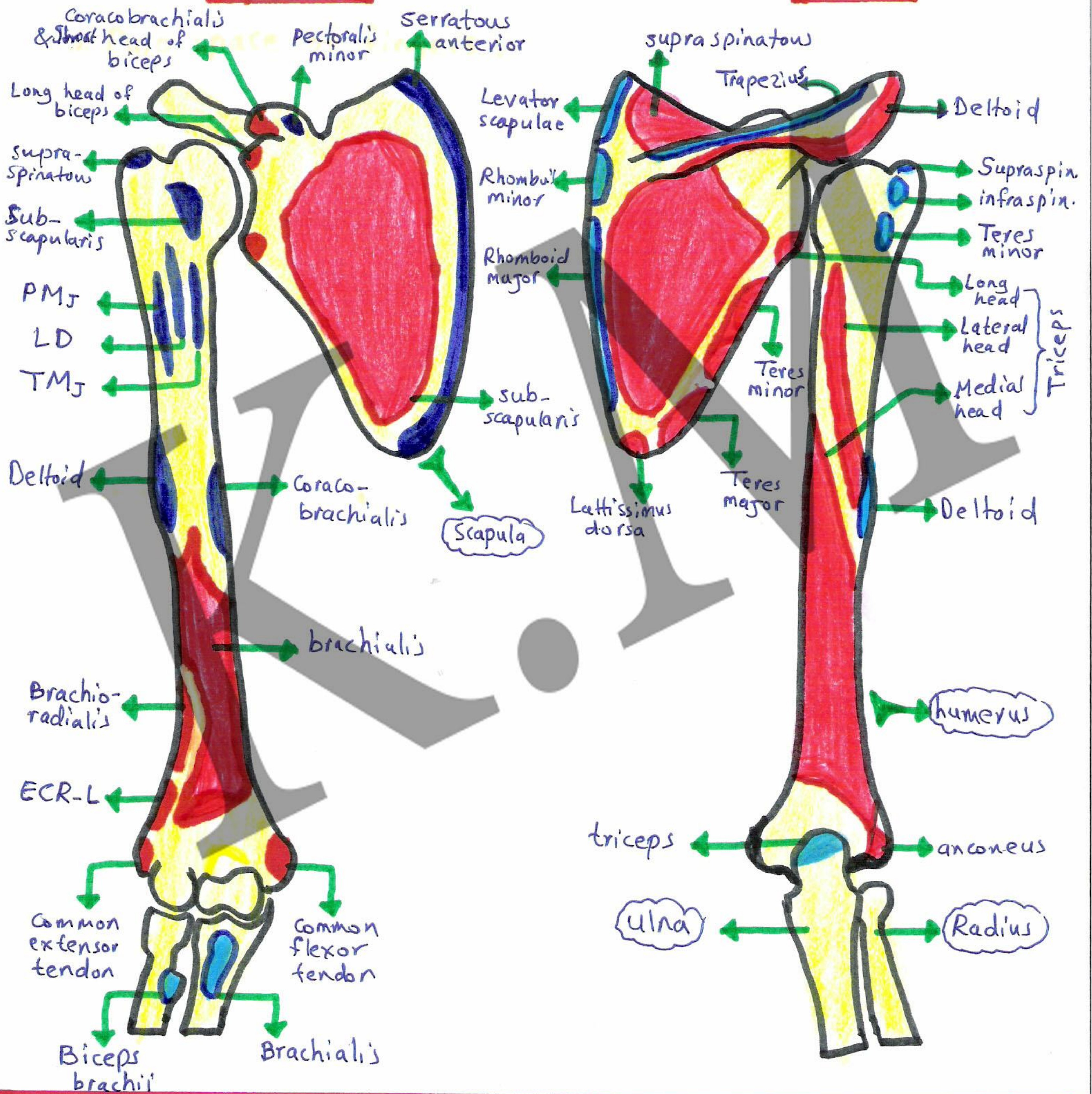


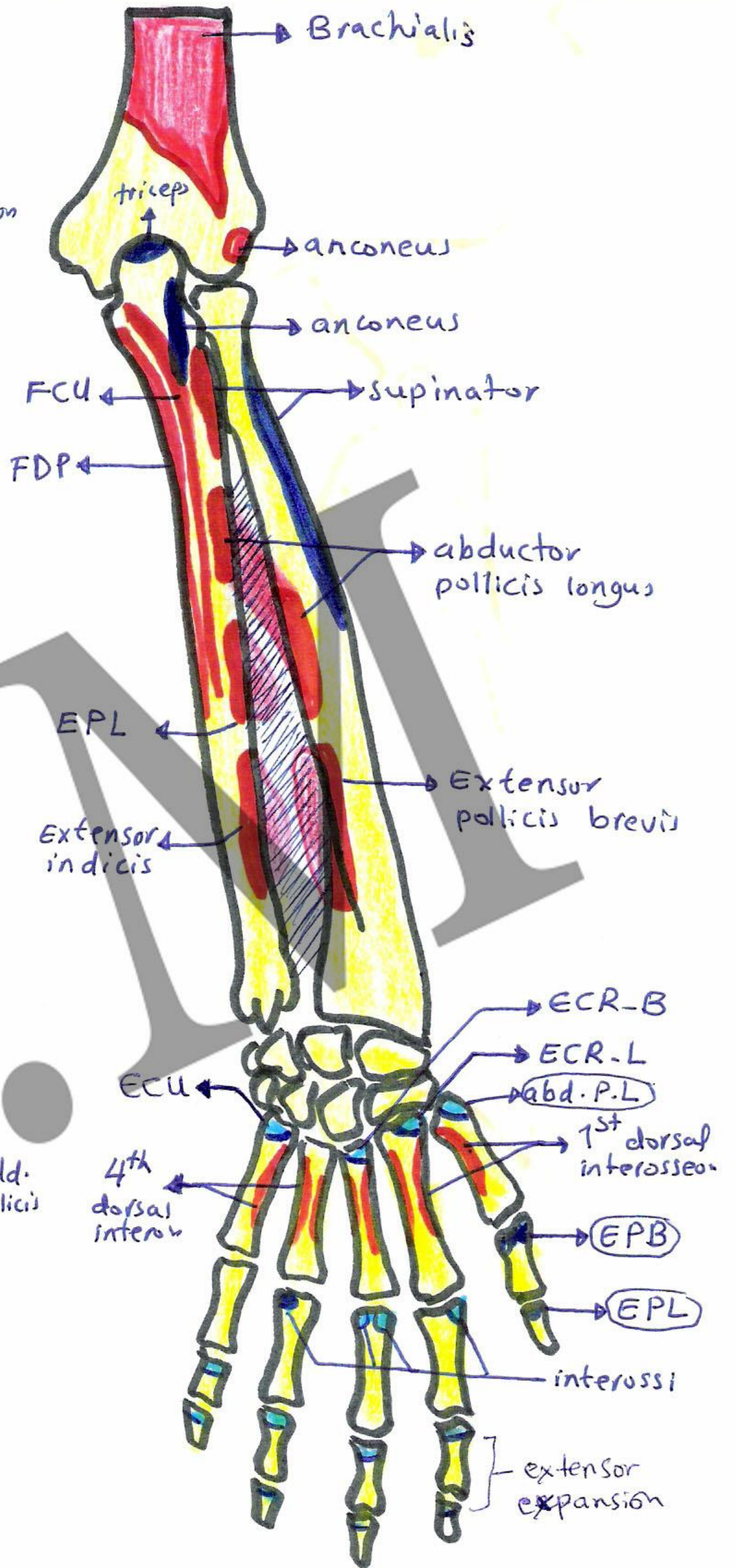
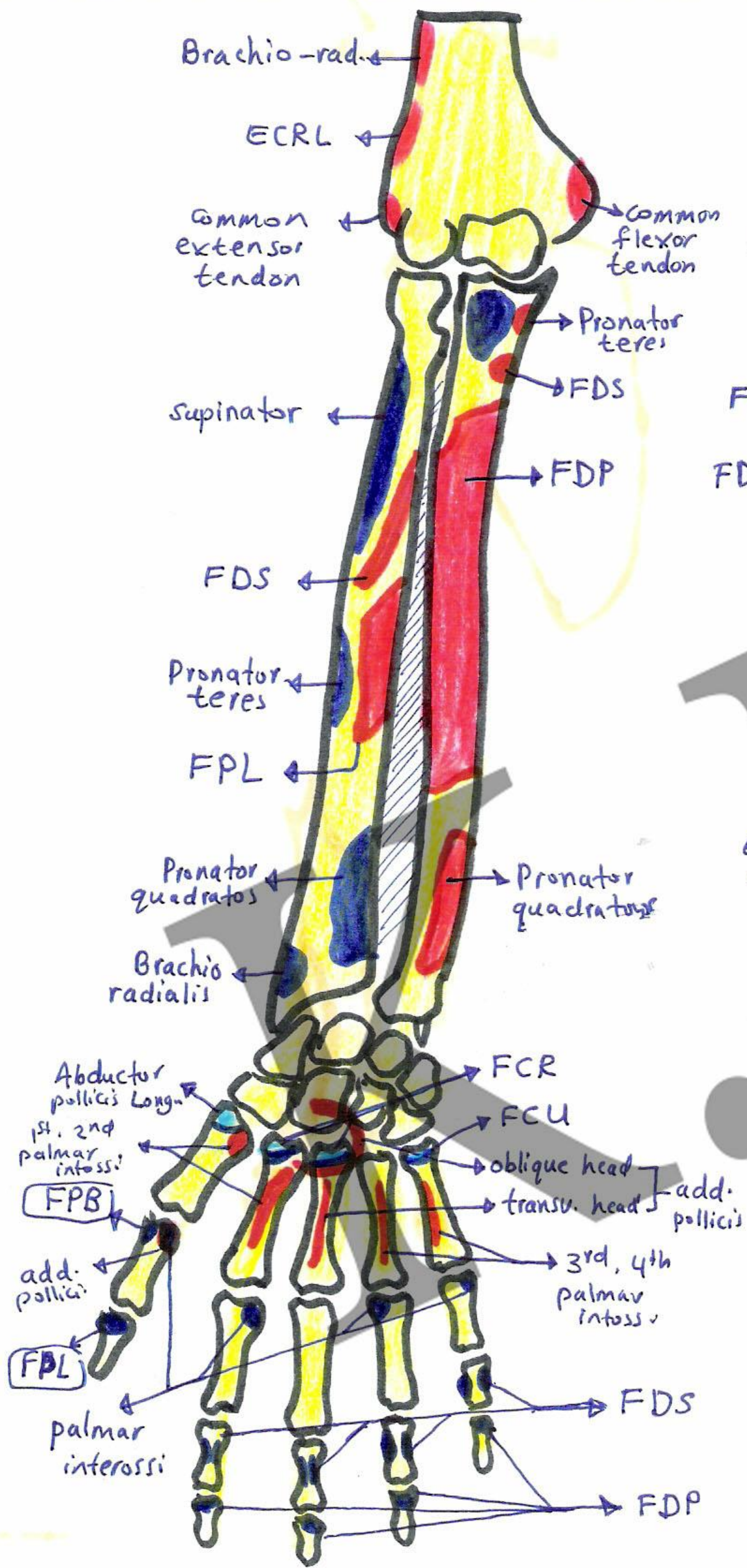
RIGHT WINGED
SCAPULA WHILST
PATIENT IS
PUSHING AGAINST
WALL

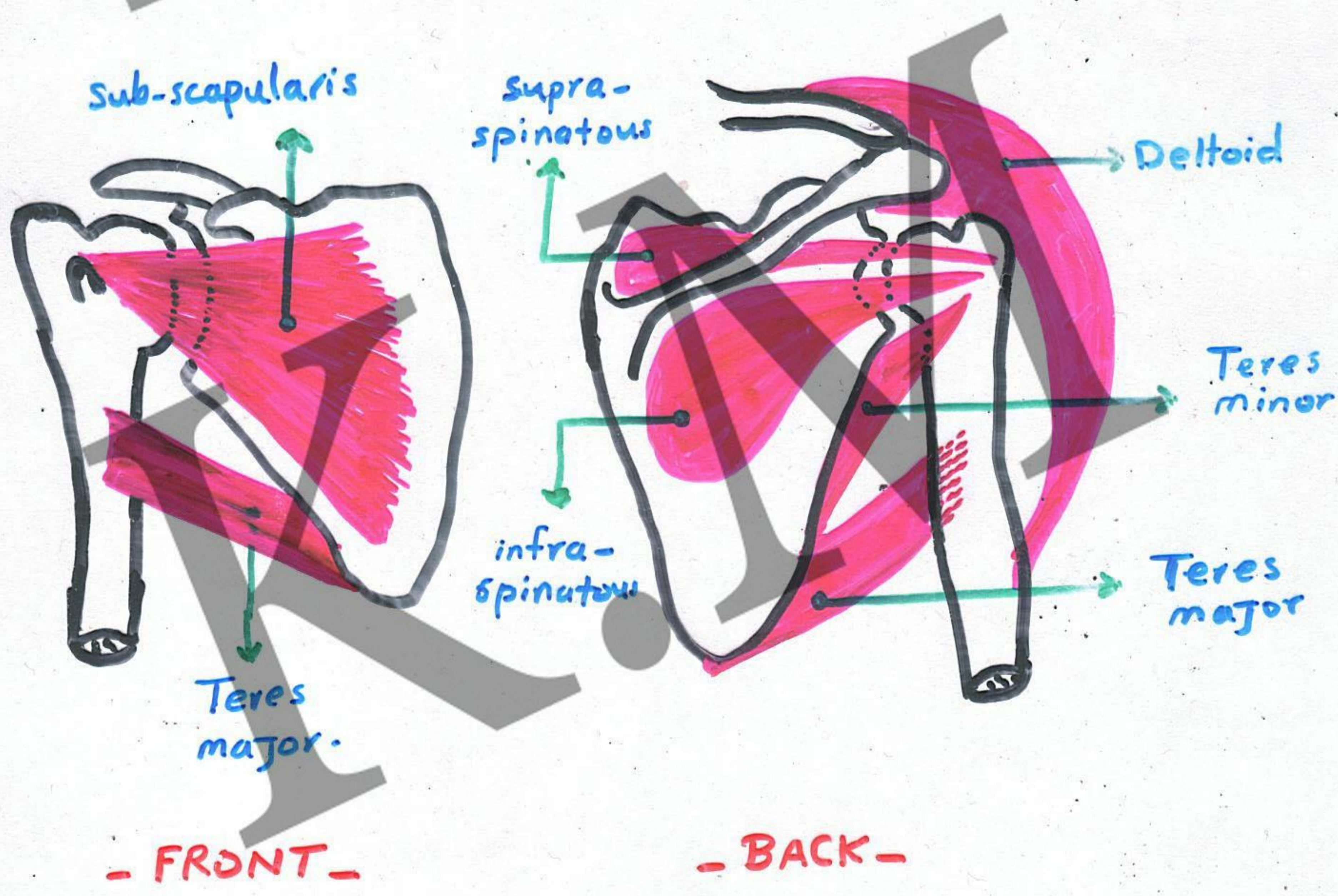
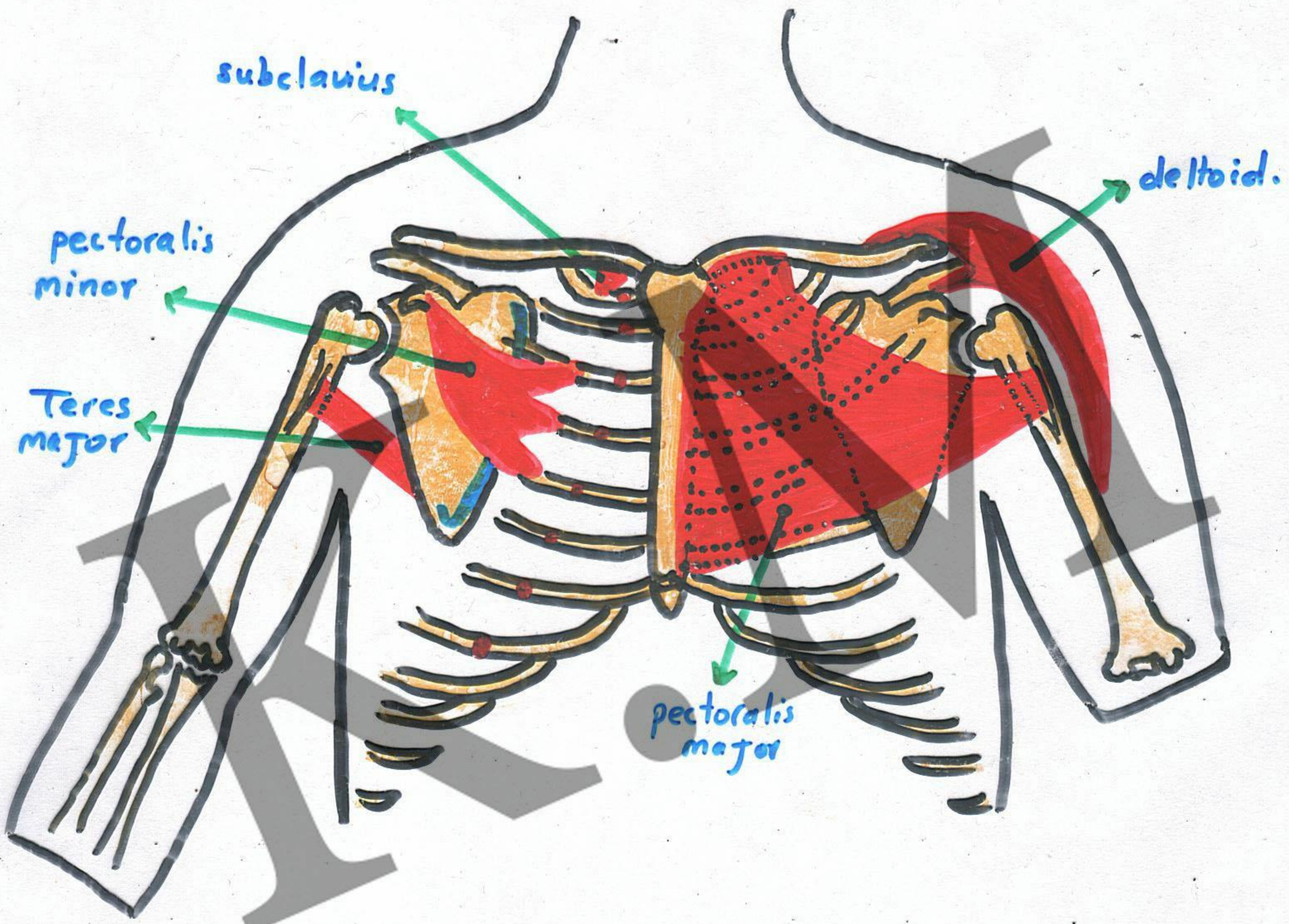
SEGMENTAL NERVE SUPPLY TO MUSCLES

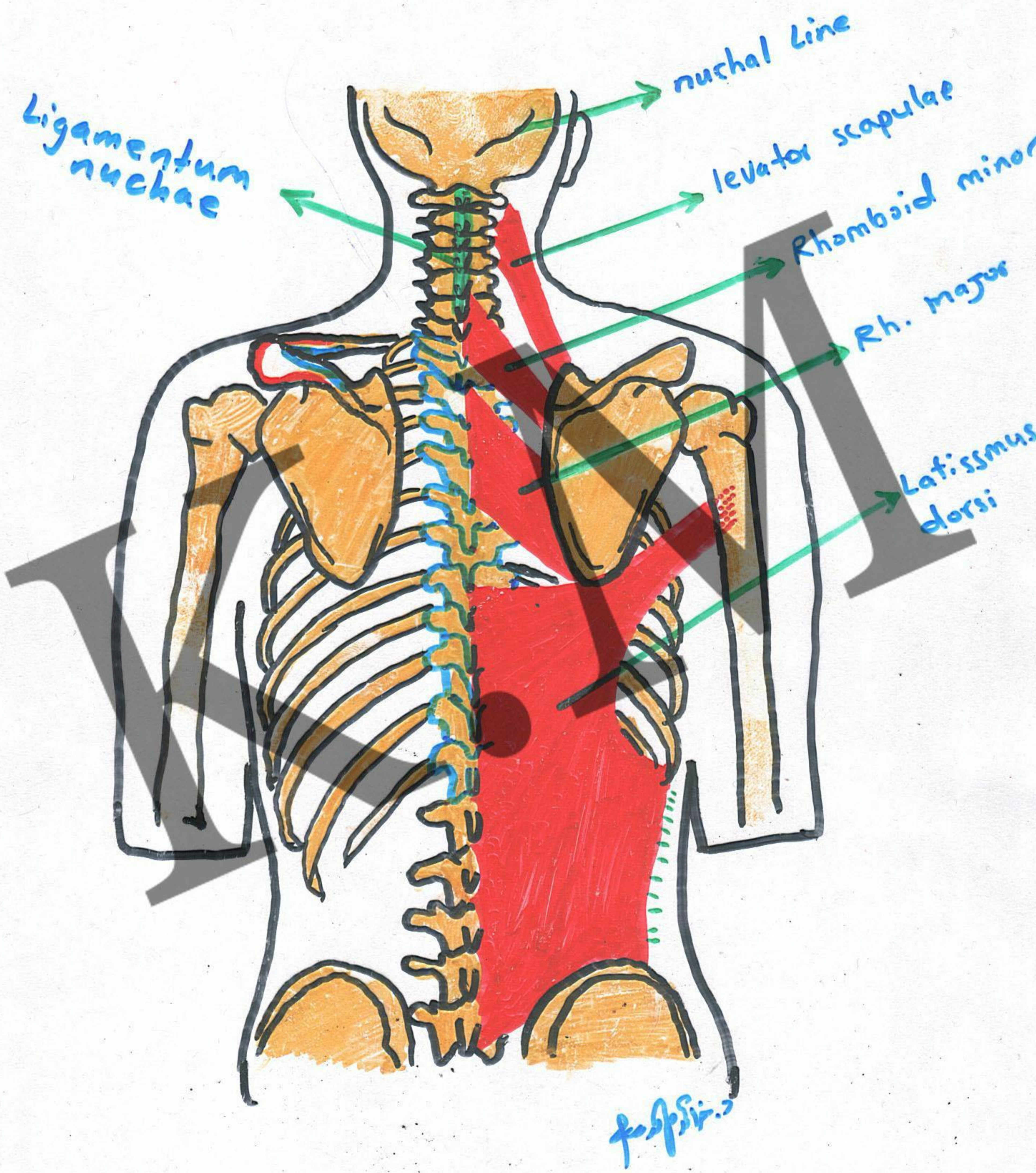
SEGMENT	MUSCLE	NERVE
C5,6	Biceps brachii	Musculocutaneous
C5,6	Brachialis	Musculocutaneous & radial
C5,6	Brachioradialis	Radial
C5,6	Coracobrachialis	Musculocutaneous
C5,6	Deltoid	Axillary
C5,6	Infraspinatus	Suprascapular
C5,6	Subscapularis	Upper & lower subscapular
C5,6	Supraspinatus	Suprascapular
C5,6	Teres major	Lower subscapular
C5,6	Teres minor	Axillary
C6,7	Abductor pollicis longus	Posterior interosseous
C6,7	Extensor carpi radialis brevis	Posterior interosseous
C6,7	Extensor carpi radialis longus	Radial
C6,7	Extensor pollicis brevis	Posterior interosseous
C6,7	Flexor carpi radialis	Median
C6,7	Palmaris longus	Median
C6,7	Pronator teres	Median
C6,7	Supinator	Posterior interosseous
C6,7	Extensor carpi ulnaris	Posterior interosseous
C6,7	Extensor digitorum	Posterior interosseous
C6,7	Extensor indicis	Posterior interosseous
C6,7	Extensor pollicis longus	Posterior interosseous
C6,7	Triceps	Radial
C7,8	Anconeus	Radial
C7,8	Extensor digiti minimi	Posterior interosseous
C7,8	Flexor digitorum profundus	Ulnar/ant interosseous
C7,8	Flexor digitorum superficialis	Median
C8,T1	Abductor digiti minimi	Ulnar - deep branch
C8,T1	Abductor pollicis brevis	Median- muscular branch
C8,T1	Adductor pollicis	Ulnar - deep branch
C8,T1	Flexor carpi ulnaris	Ulnar
C8,T1	Flexor digiti minimi	Ulnar - deep branch
C8,T1	Flexor pollicis brevis	Median- muscular branch
C8,T1	Flexor pollicis longus	Anterior interosseous
C8,T1	Interossei	Ulnar - deep branch
C8,T1	Lumbricals	Ulnar - deep branch/median
C8,T1	Opponens digiti minimi	Ulnar - deep branch
C8,T1	Opponens pollicis	Median- muscular branch
C8,T1	Palmaris brevis	Ulnar - superficial branch
C8,T1	Pronator quadratus	Anterior interosseous

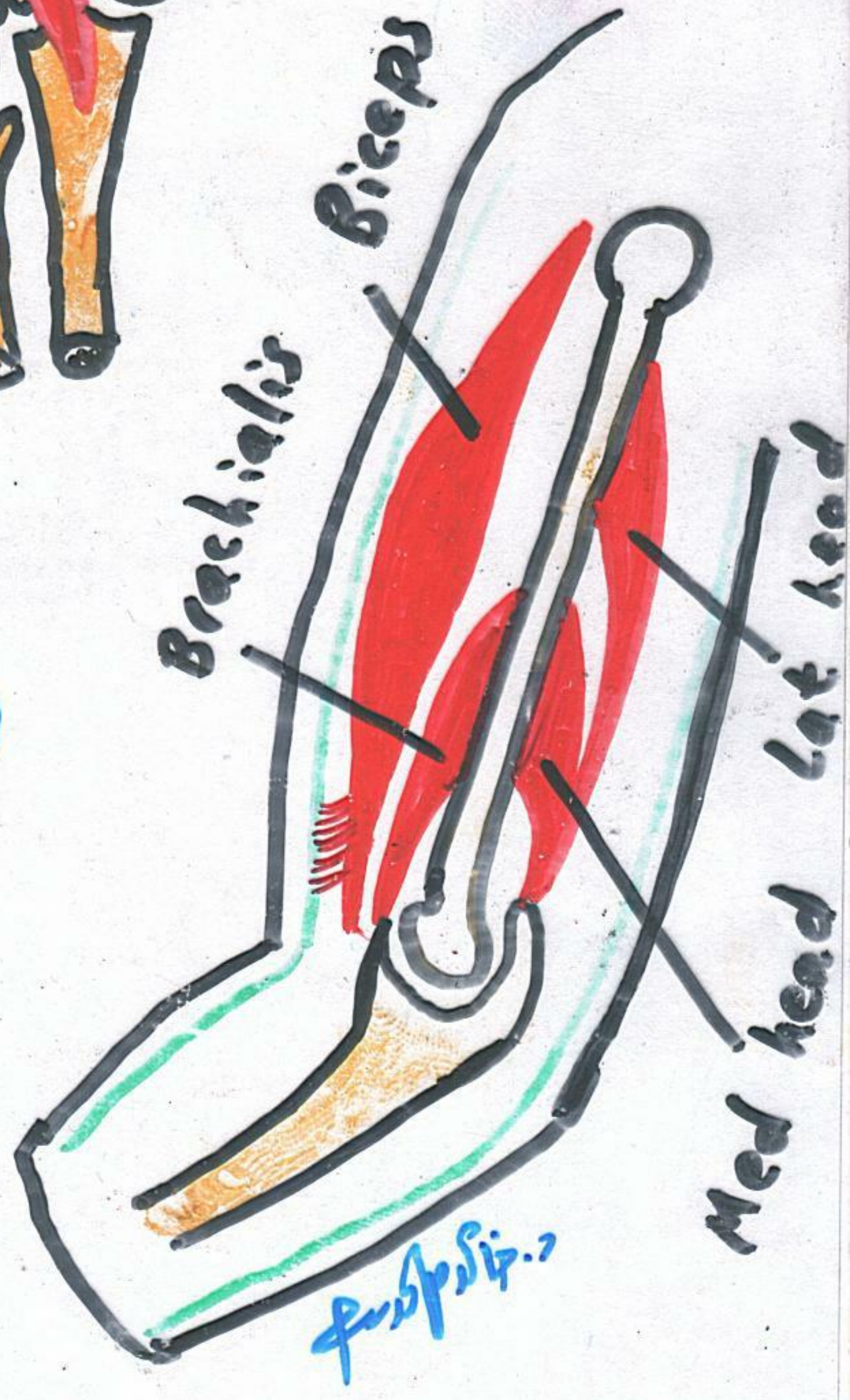
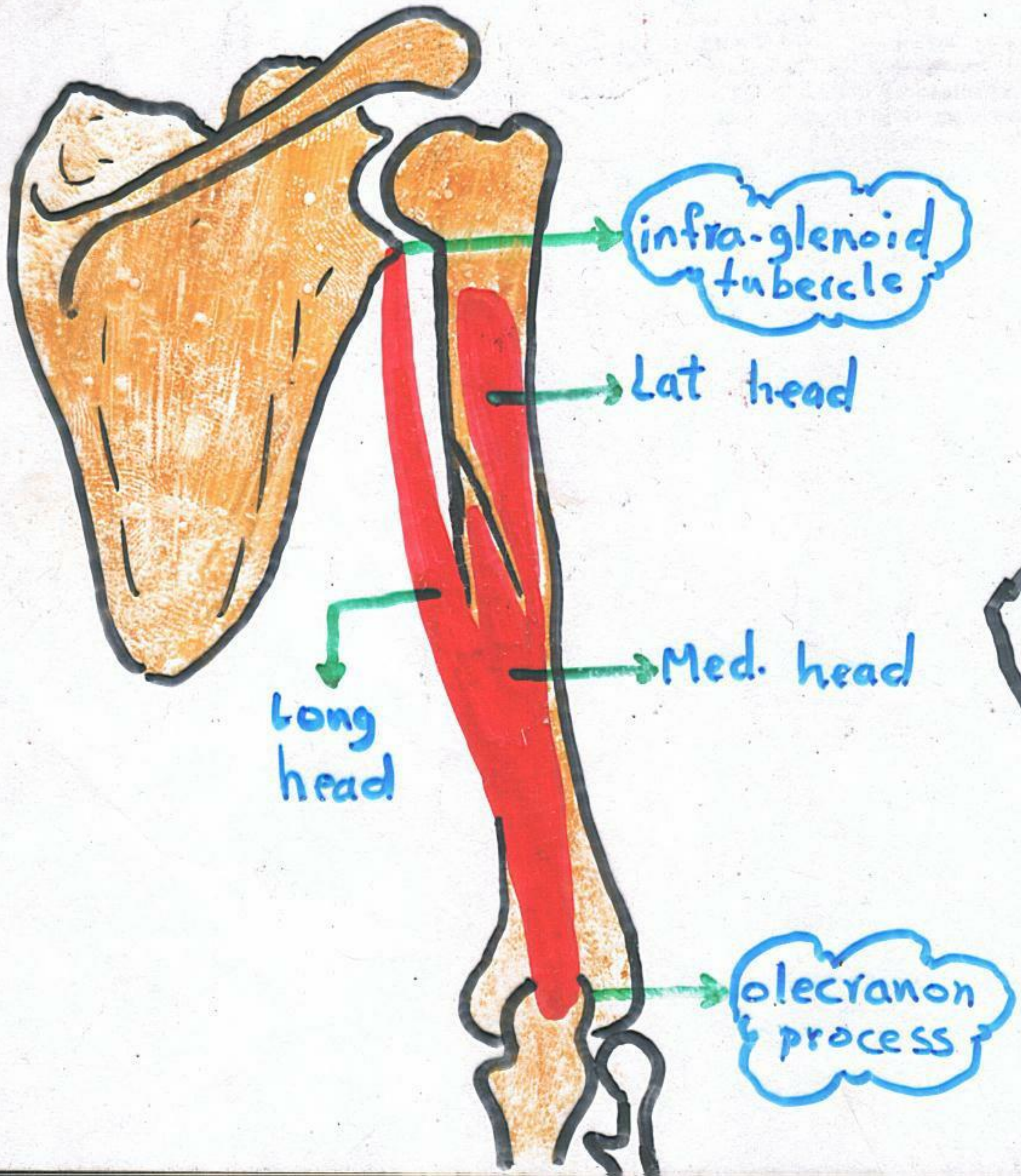
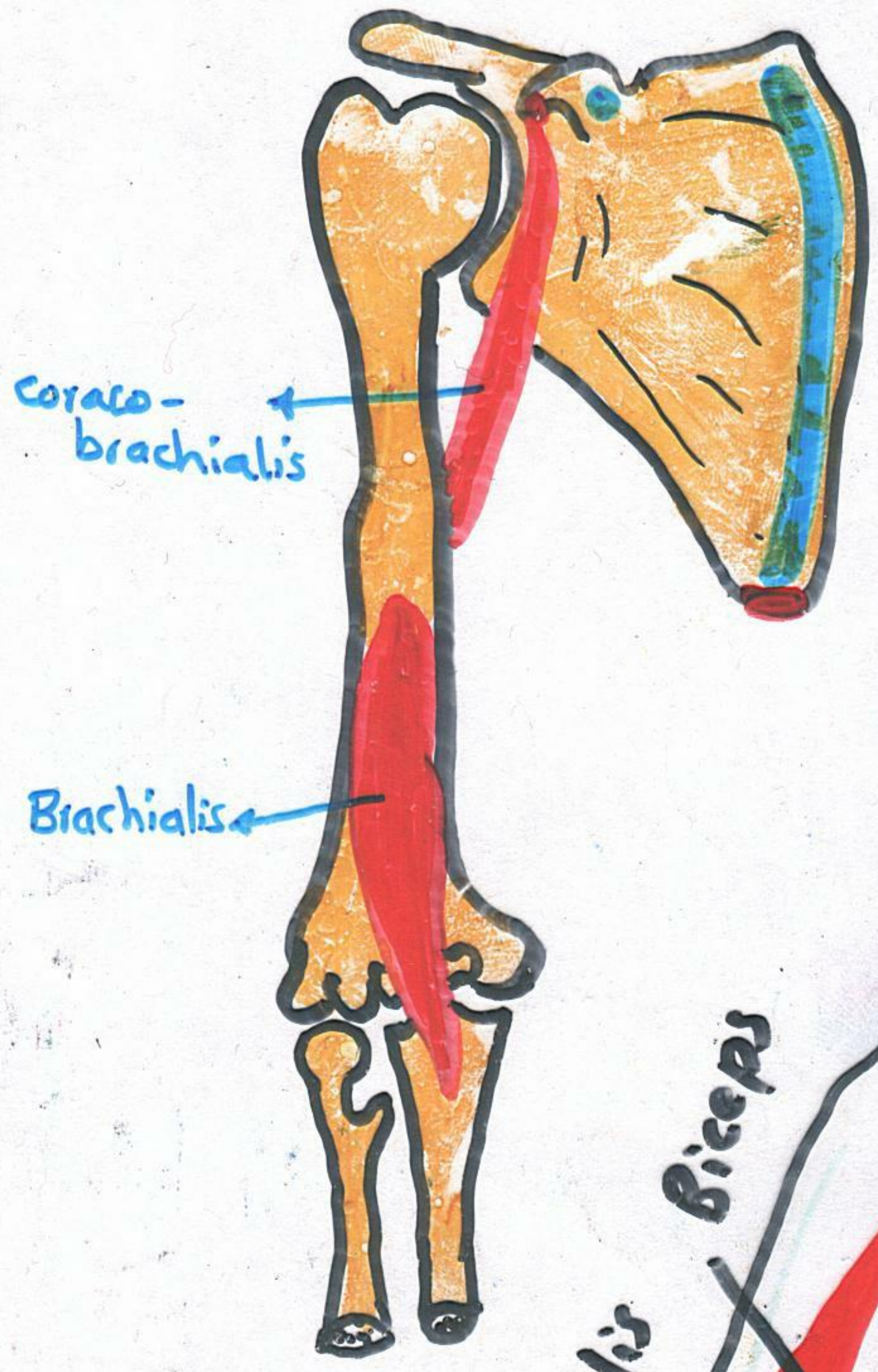
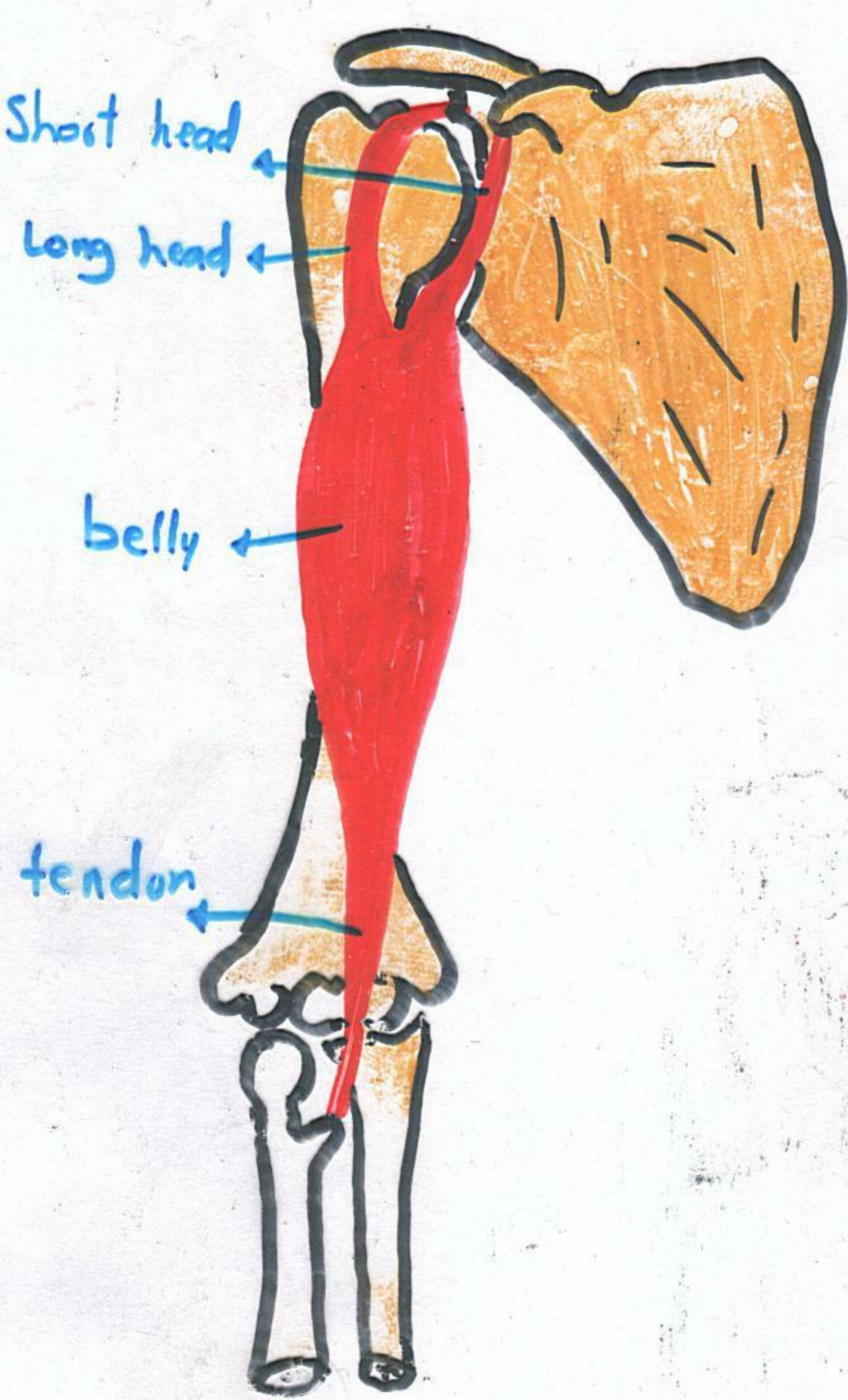
BONES OF UPPER LIMB.

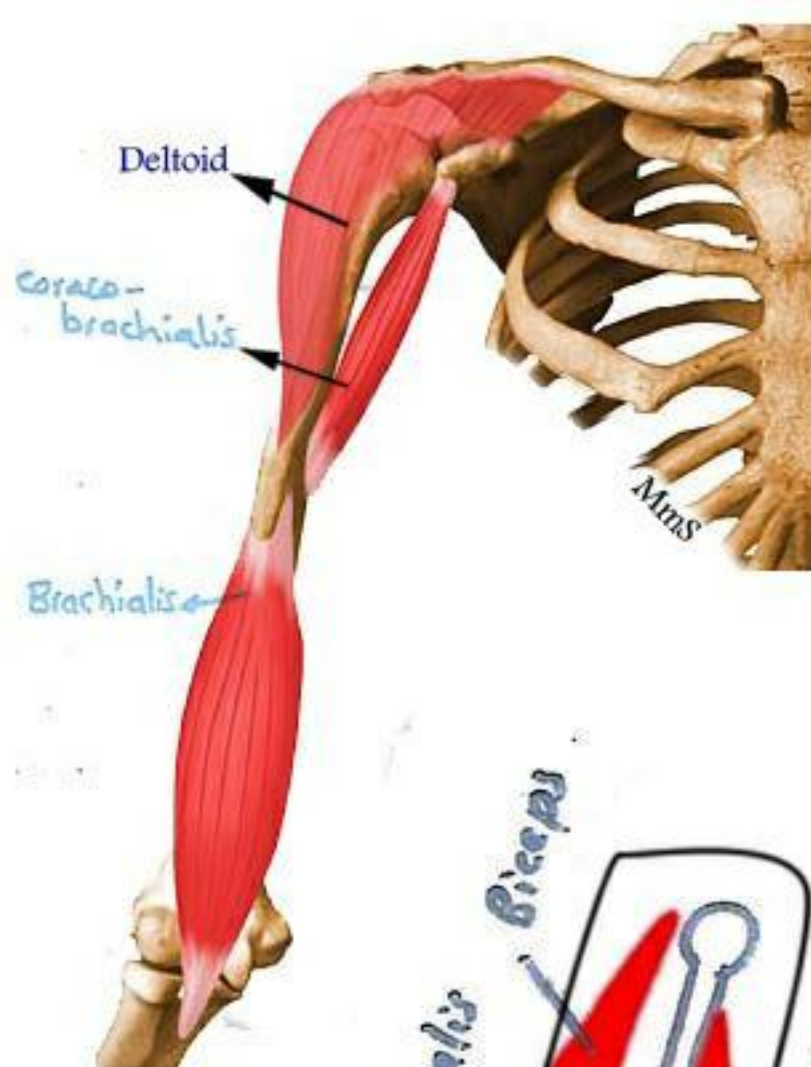
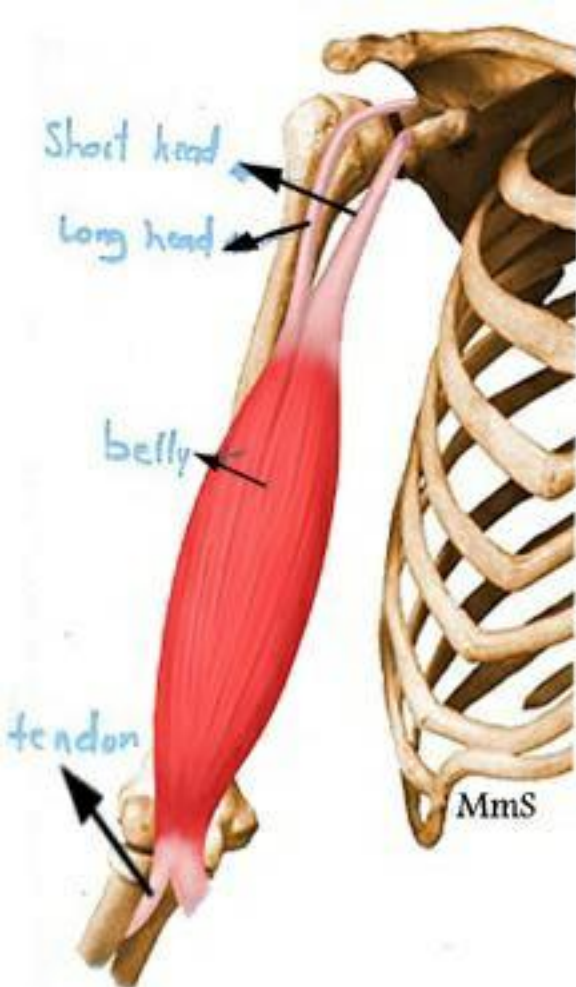




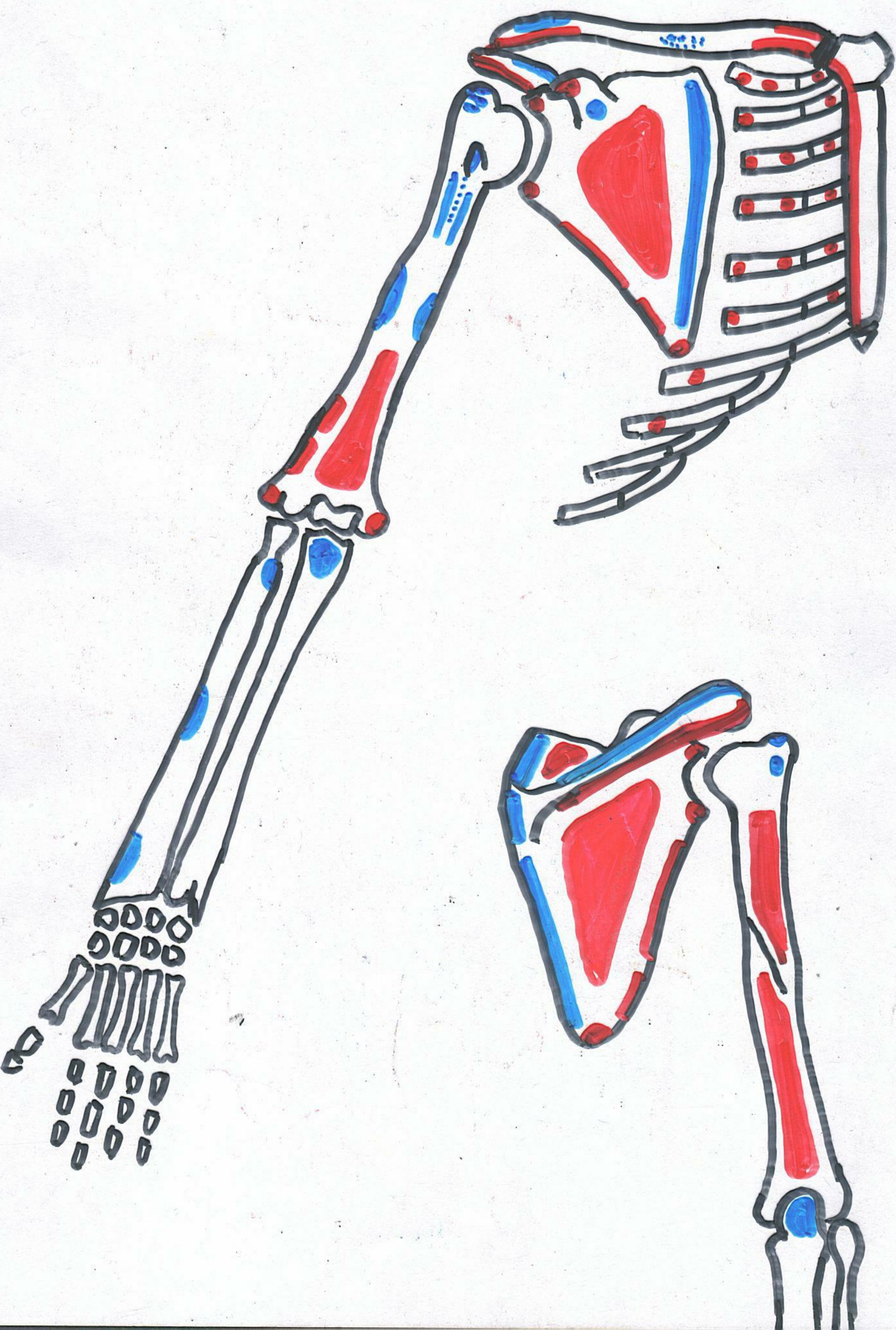








Muscle attachment of upper limb.



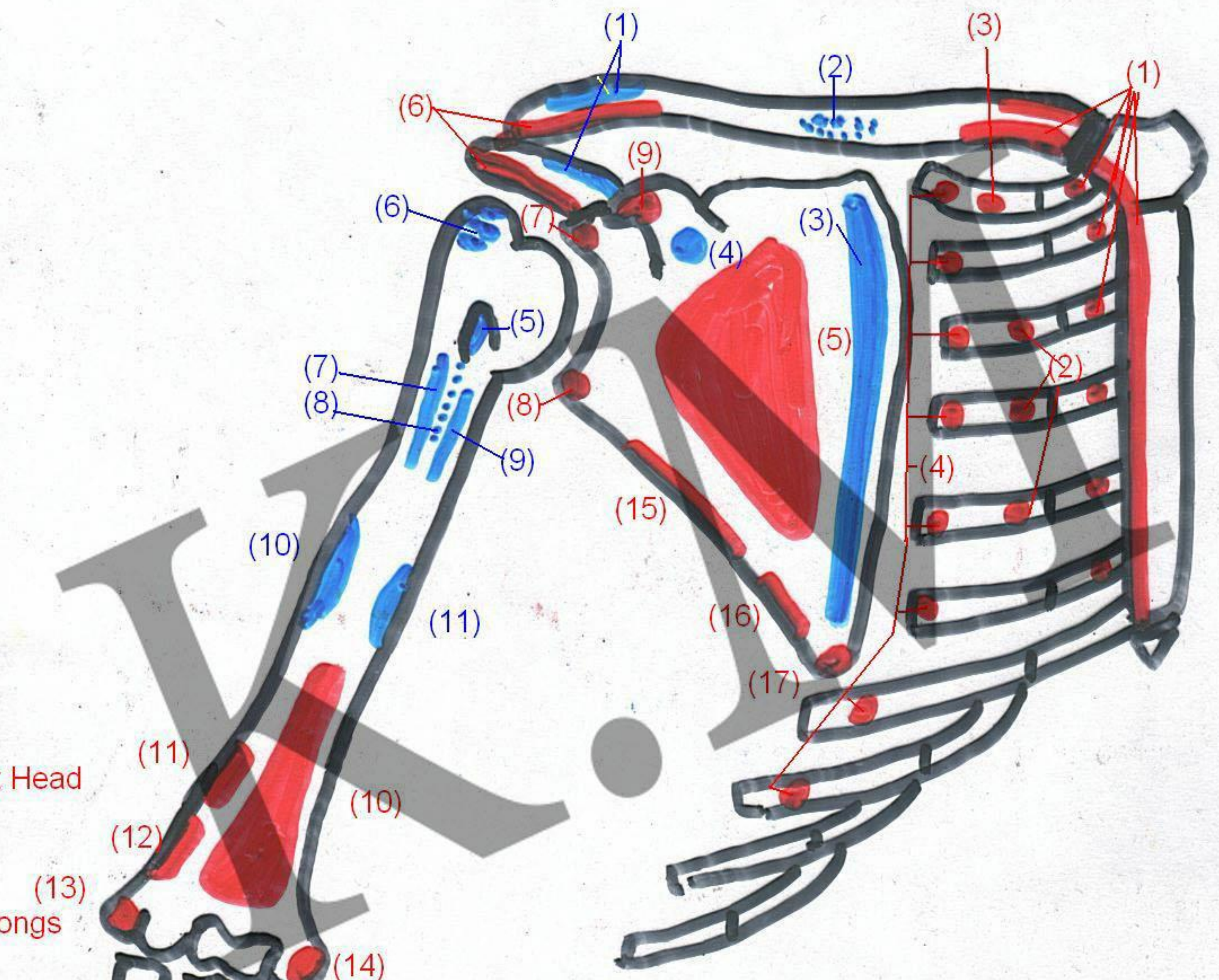
Muscle attachment of upper limb.

Insertion of:

- 1- Trapezius
- 2- Subclavius
- 3- Serratus Anterior
- 4- Pectoralis Minor (PMn)
- 5- Sub Scapularis
- 6- Supra Spinatus
- 7- Pectoralis Major (PMj)
- 8- Latissimus Dorsi
- 9- Teres Major (TMj)
- 10- Deltoid
- 11- Coracobrachialis
- 12- Brachialis
- 13- Biceps Brachii

Origin Of

- 1- Pectoralis Major (PMj)
- 2- Pectoralis Minor (PMn)
- 3- Sub Clavius
- 4- Serratus Anterior
- 5- Sub Scapularis
- 6- Deltoid
- 7- Long Head Of Biceps
- 8- Long Head Of Triceps
- 9- Coracobrachialis & Short Head of Biceps
- 10- Brachialis
- 11- Brachioradialis
- 12- Extensor carpi-radialis longs
- 13- Common Extensor
- 14- Common Flexor
- 15- Teres Minor (TMn)
- 16- Teres Major (TMj)
- 17- Latissimus Dorsi

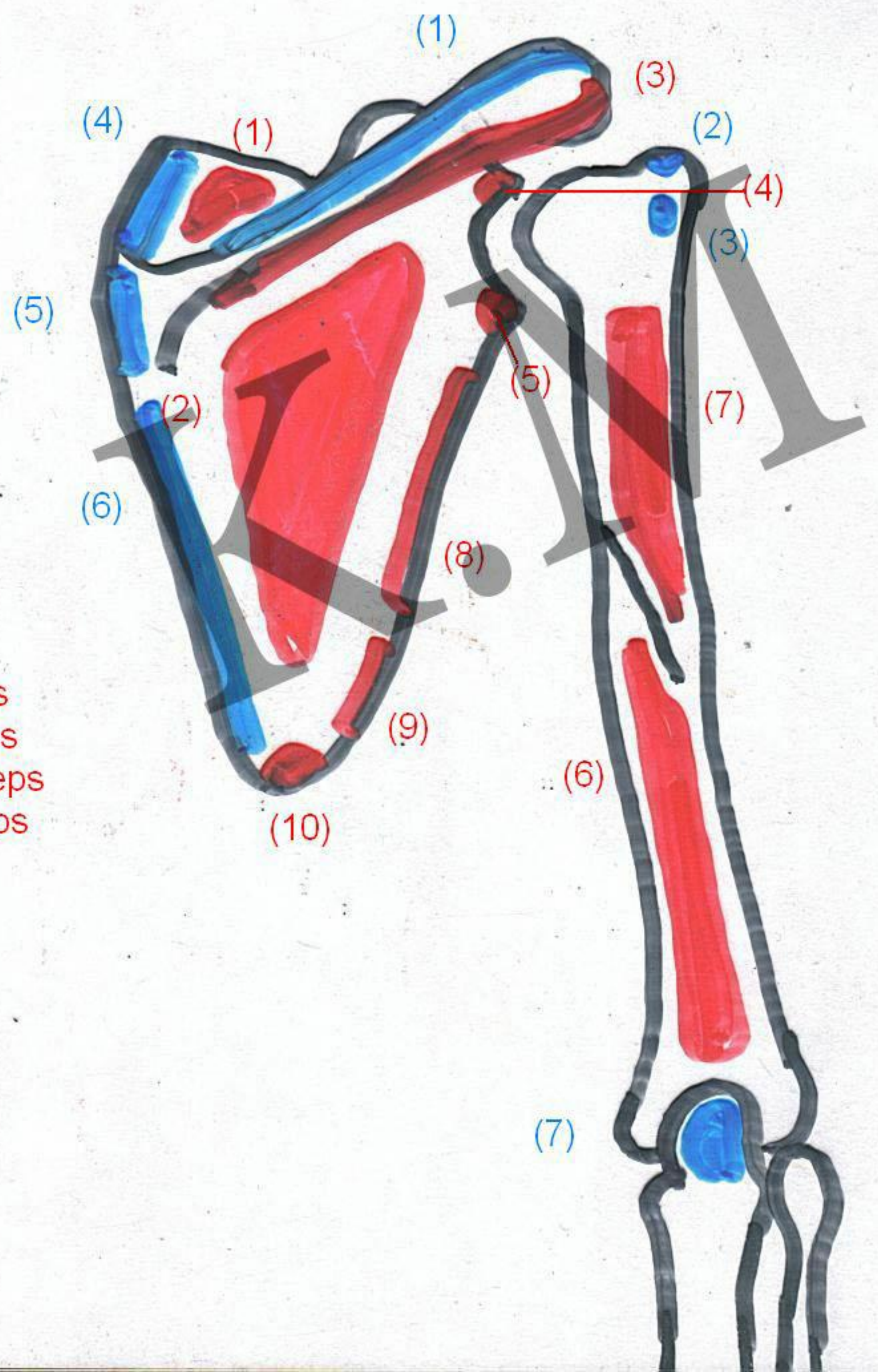


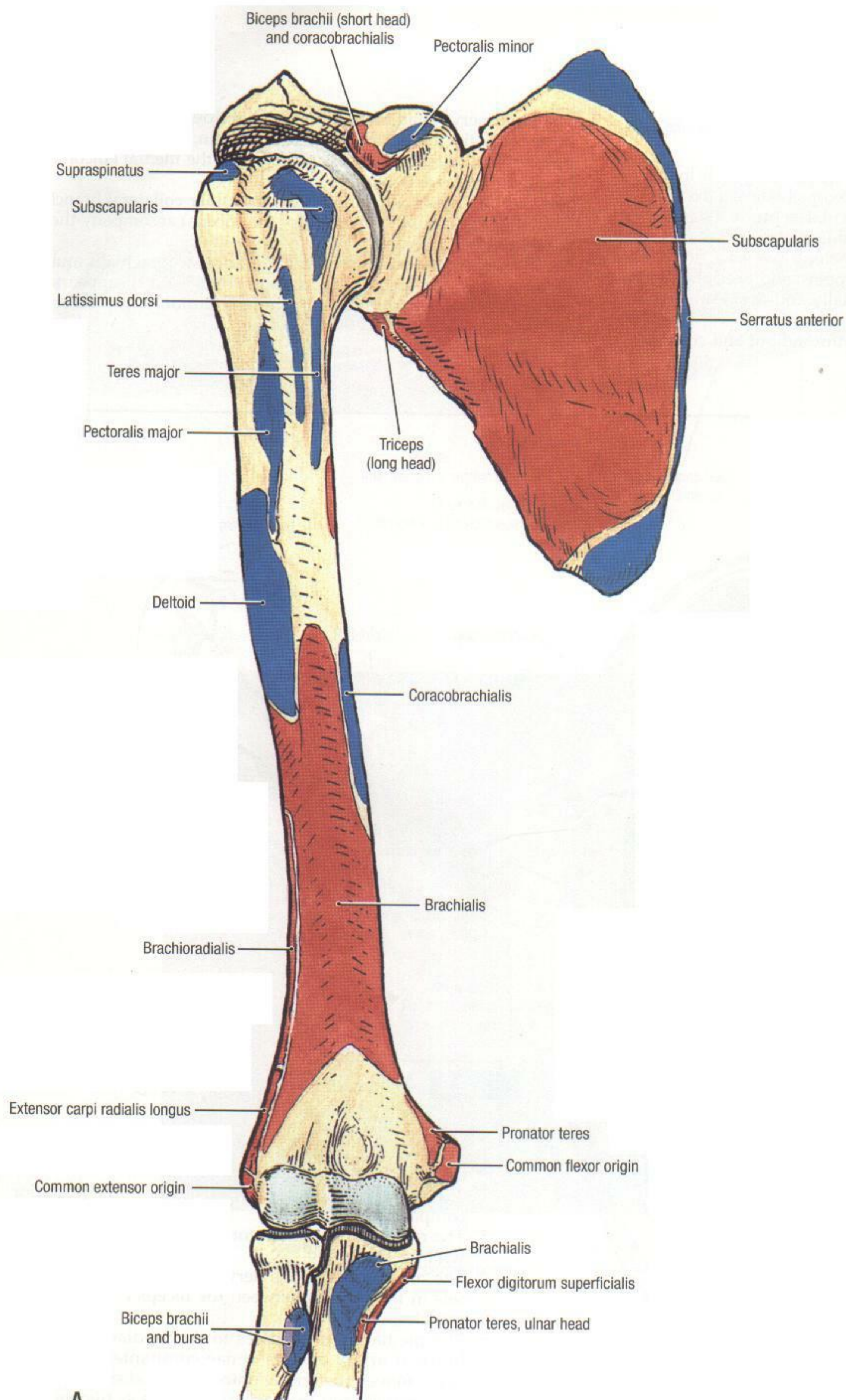
Insertion Of:

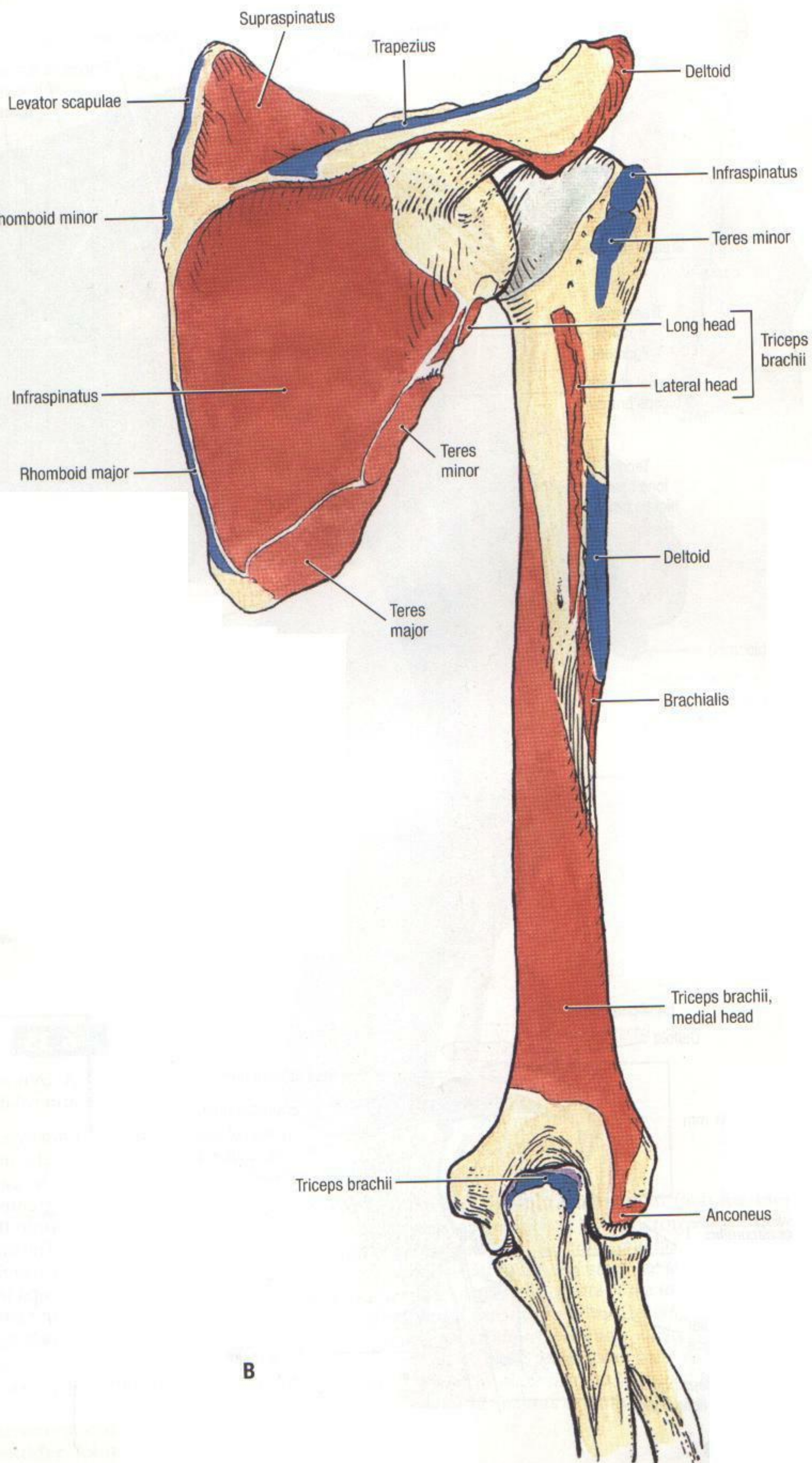
- 1- Trapezius
- 2- Teres Minor (TMn)
- 3- Infra Spinatus
- 4- Levator Scapula
- 5- Rhomboid Minor
- 6- Rhomboid Major
- 7- Triceps

Origin Of:

- 1- Supra Spinatus
- 2- Infra Spinatus
- 3- Deltoid
- 4- Long Head Of Biceps
- 5- Long Head Of Triceps
- 6- Medial Head Of Triceps
- 7- Latral Head Of Triceps
- 8- Teres Minor (TMn)
- 9- Teres Major (TMj)
- 10- Latissimus Dorsi



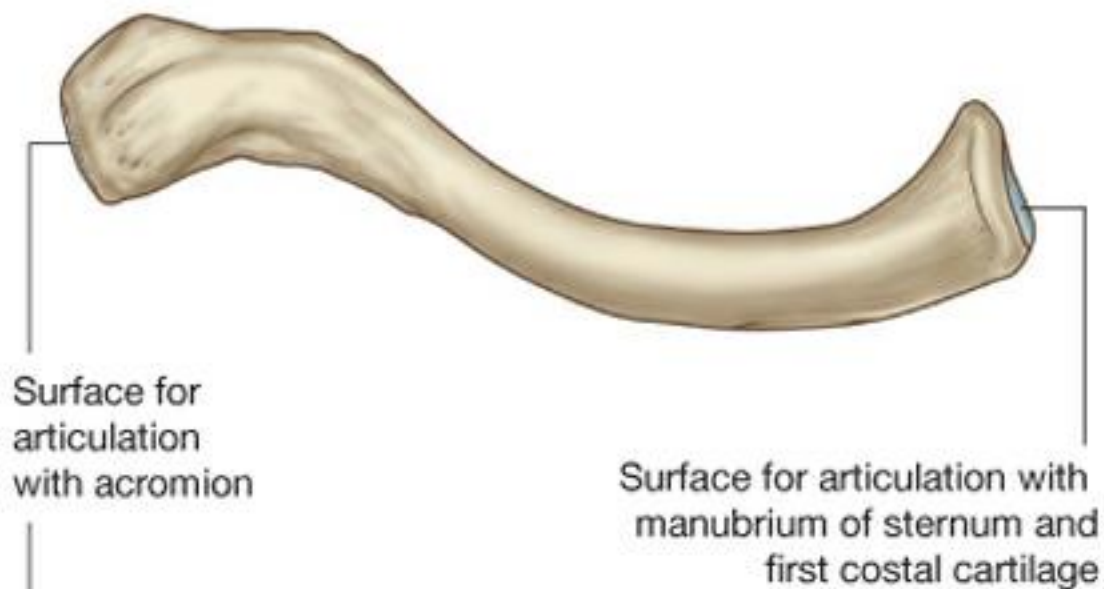




Superior view

Lateral

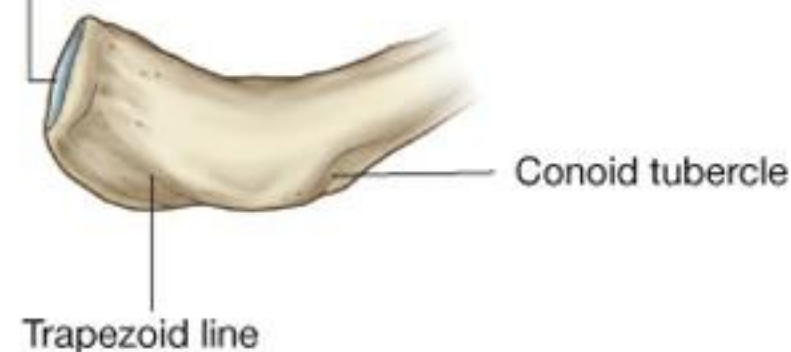
Medial

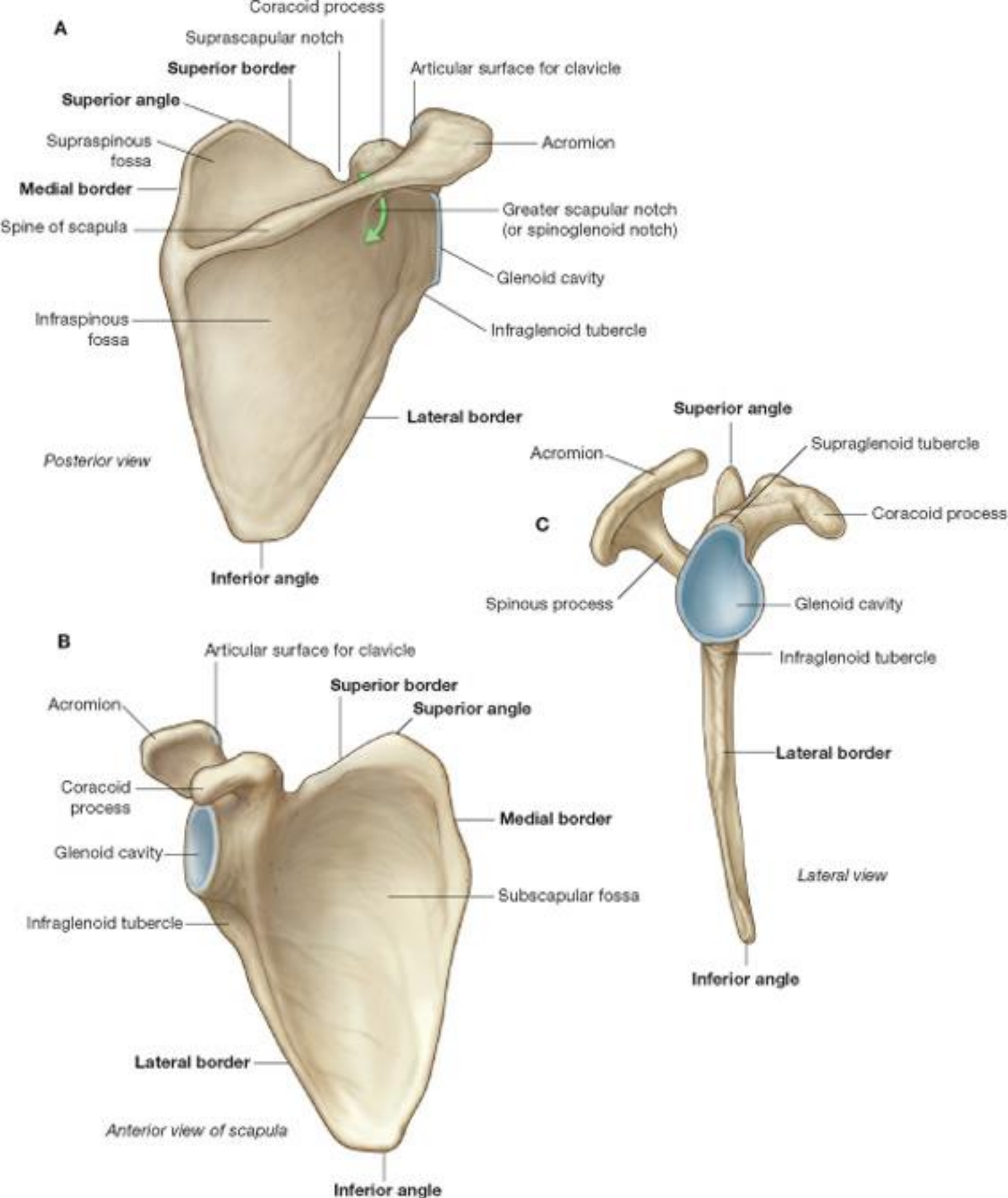


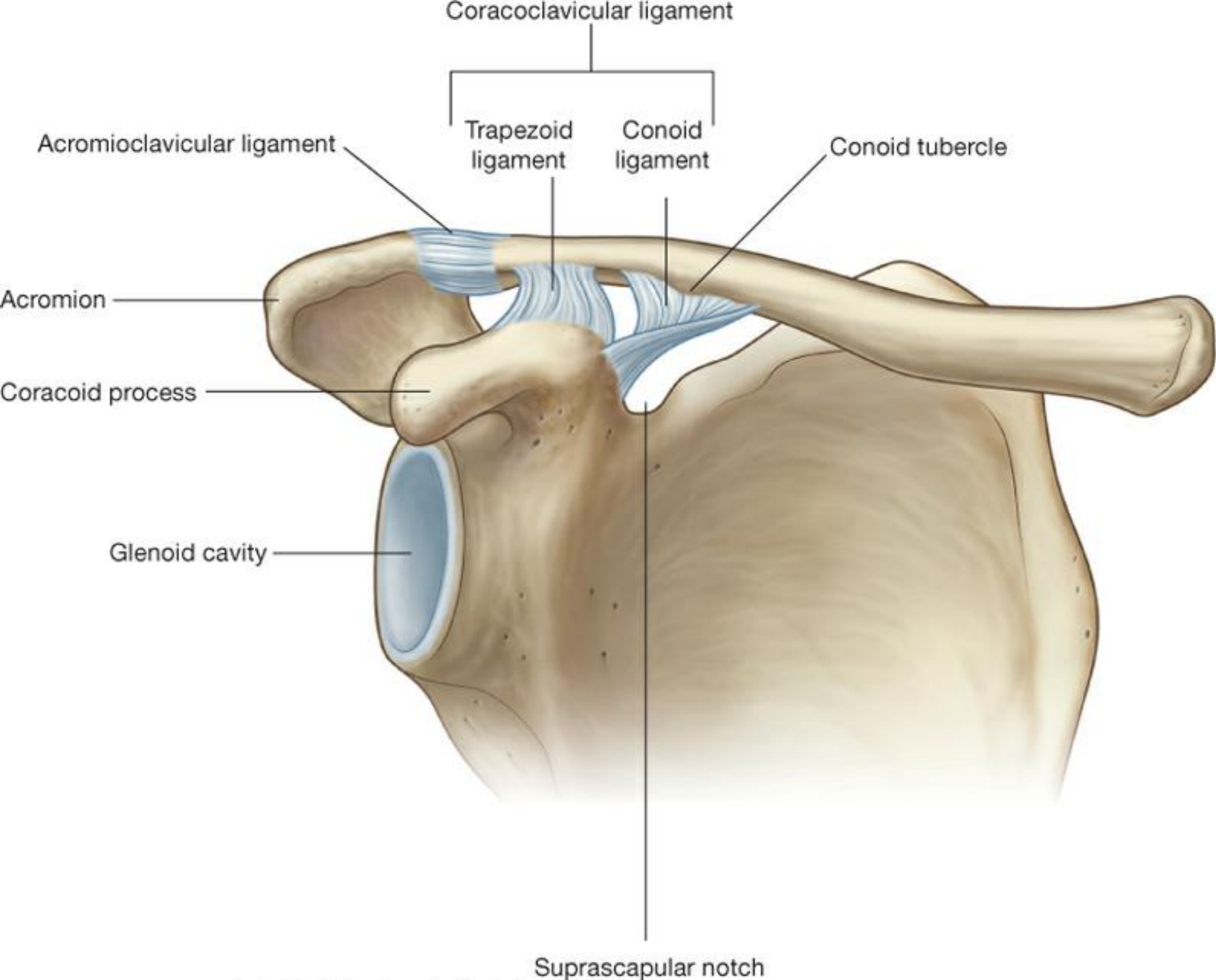
Anterior view

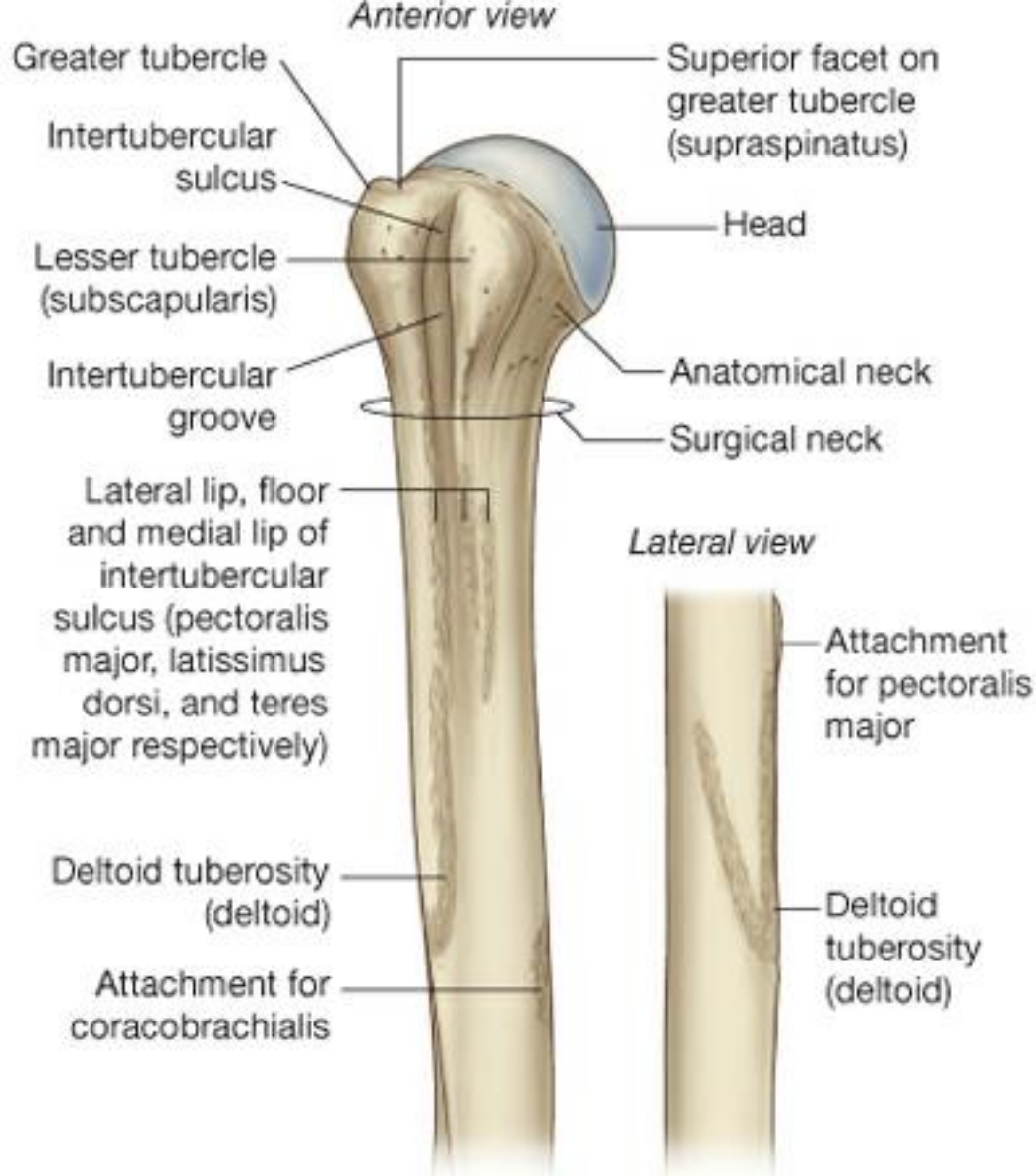


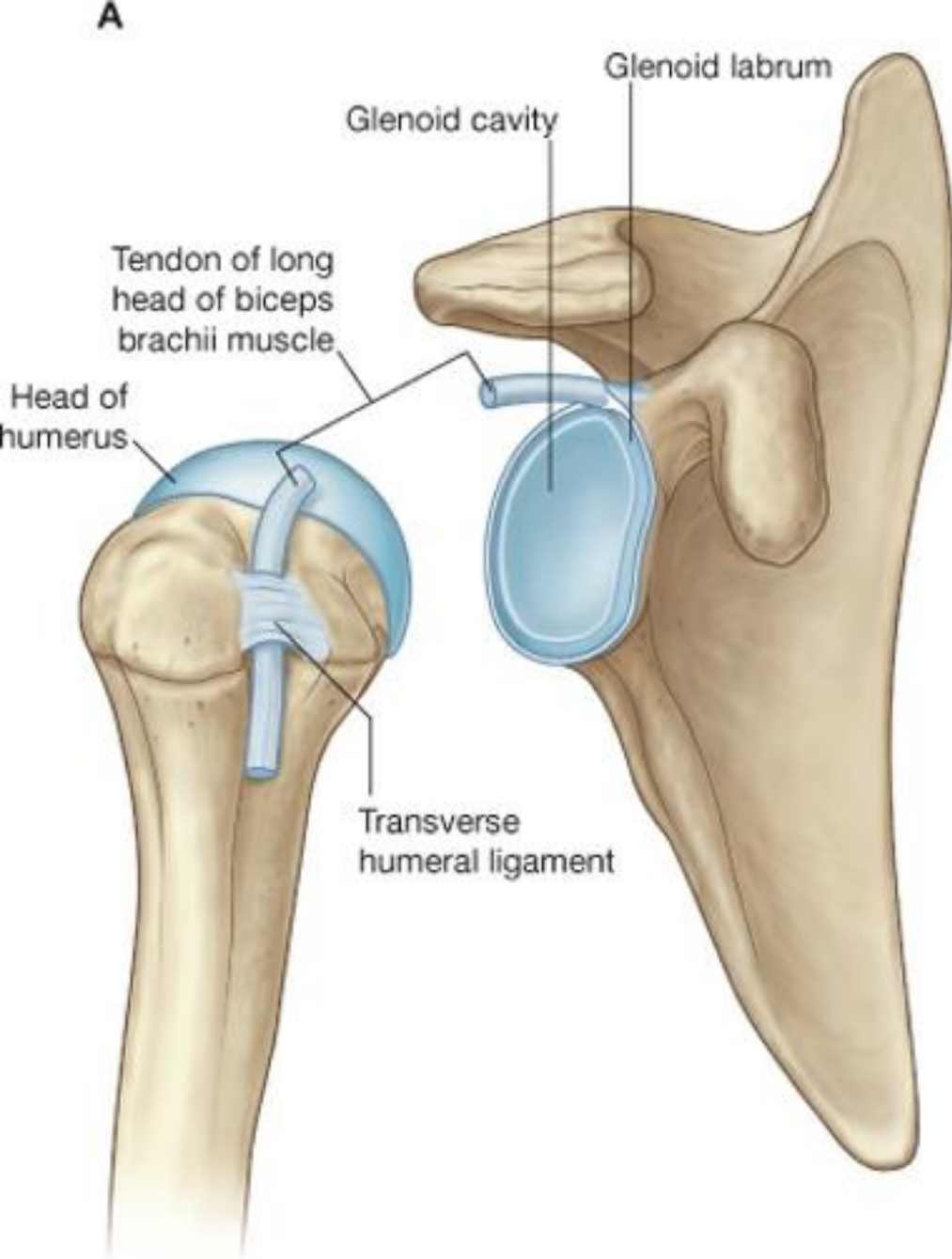
Inferior view

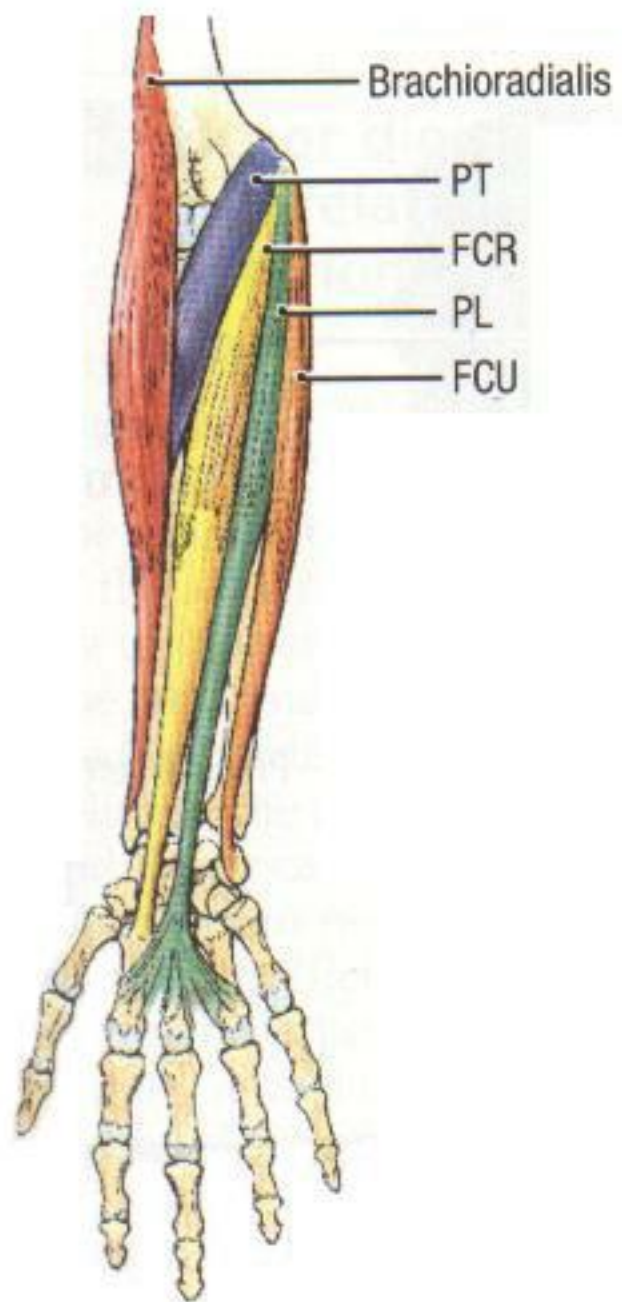




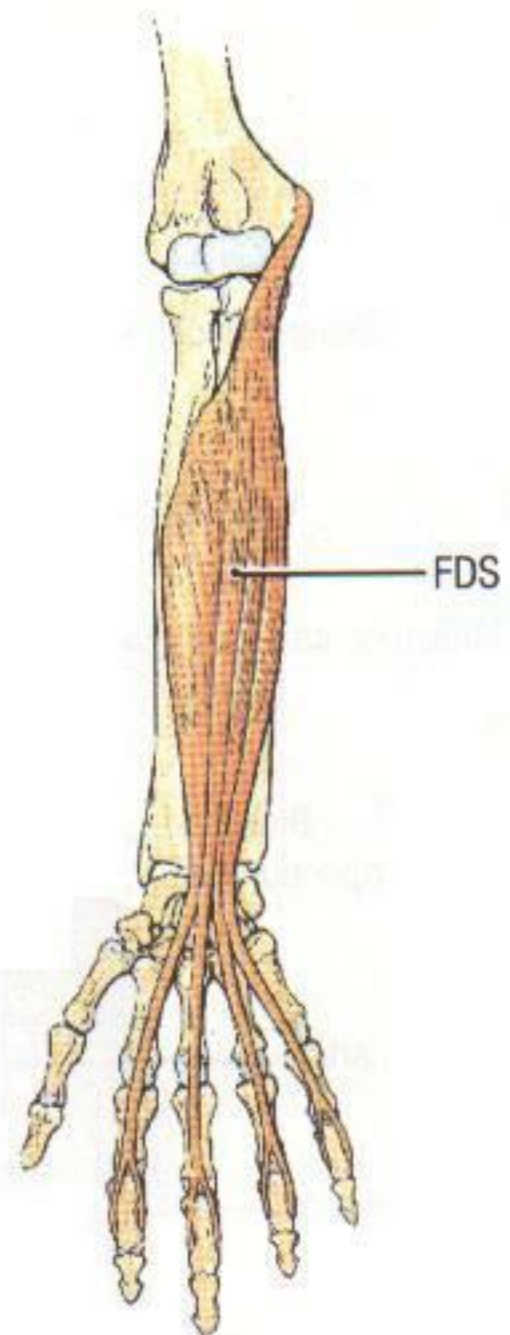




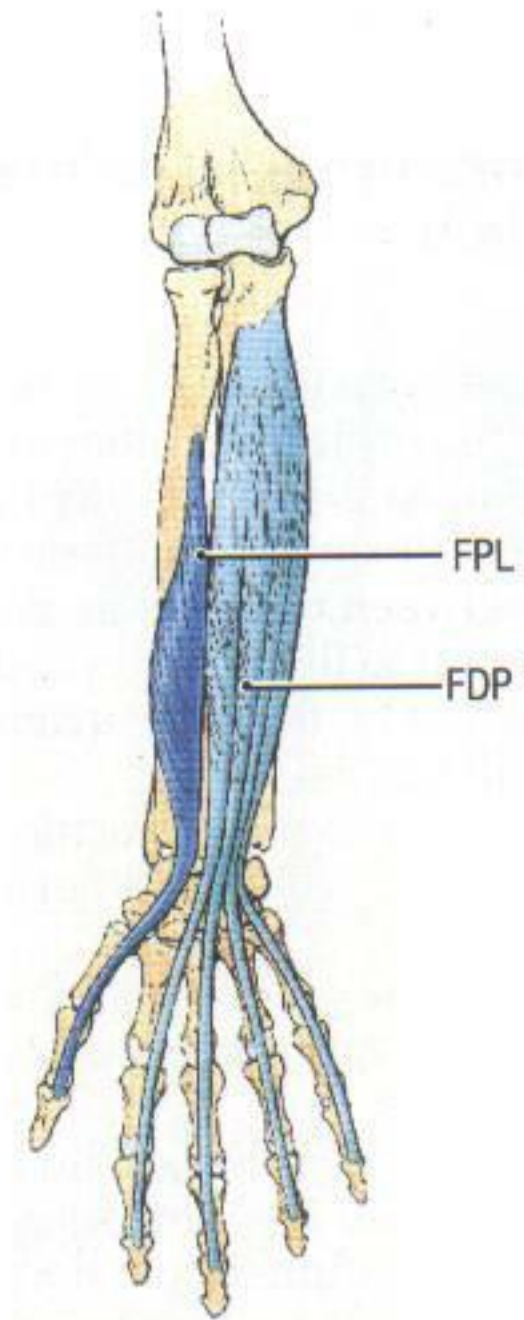




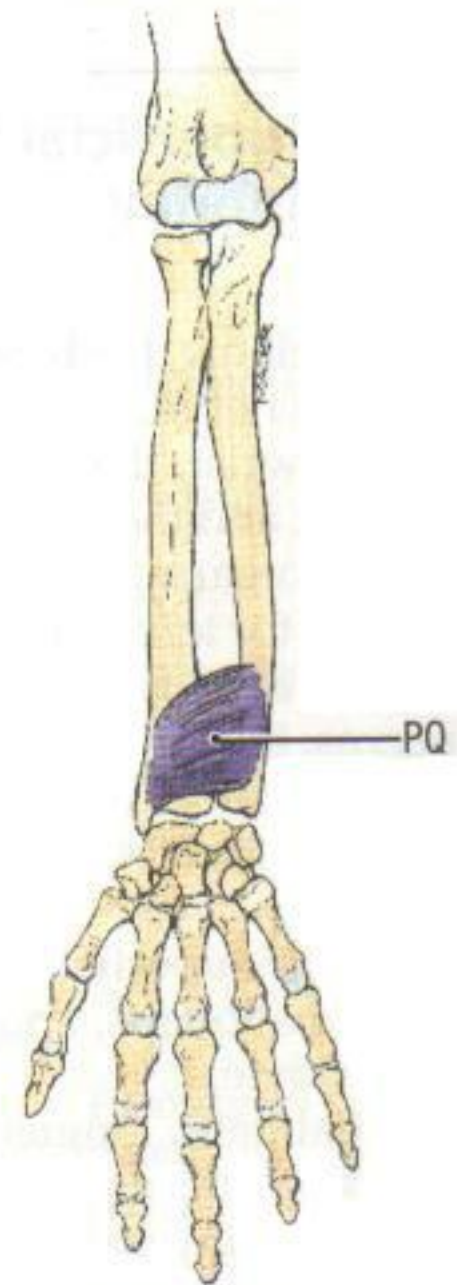
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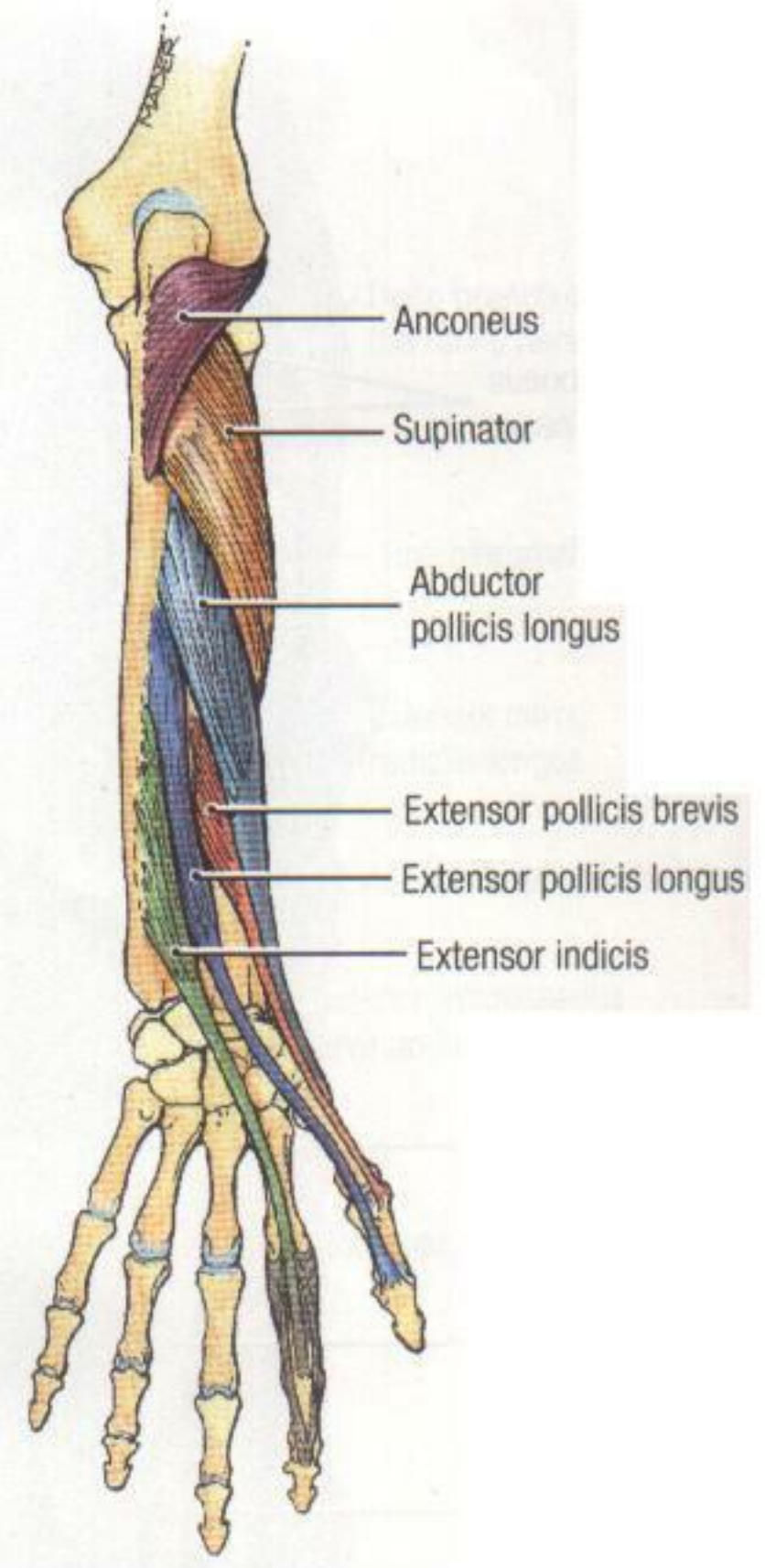
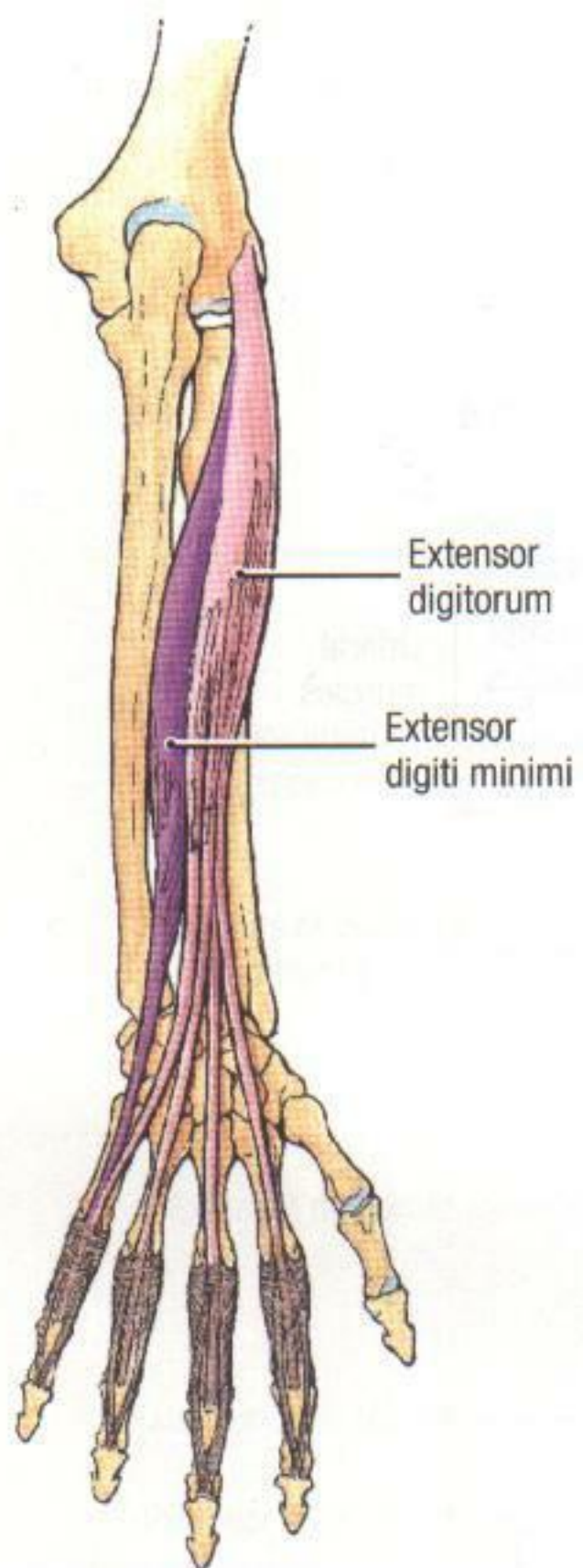
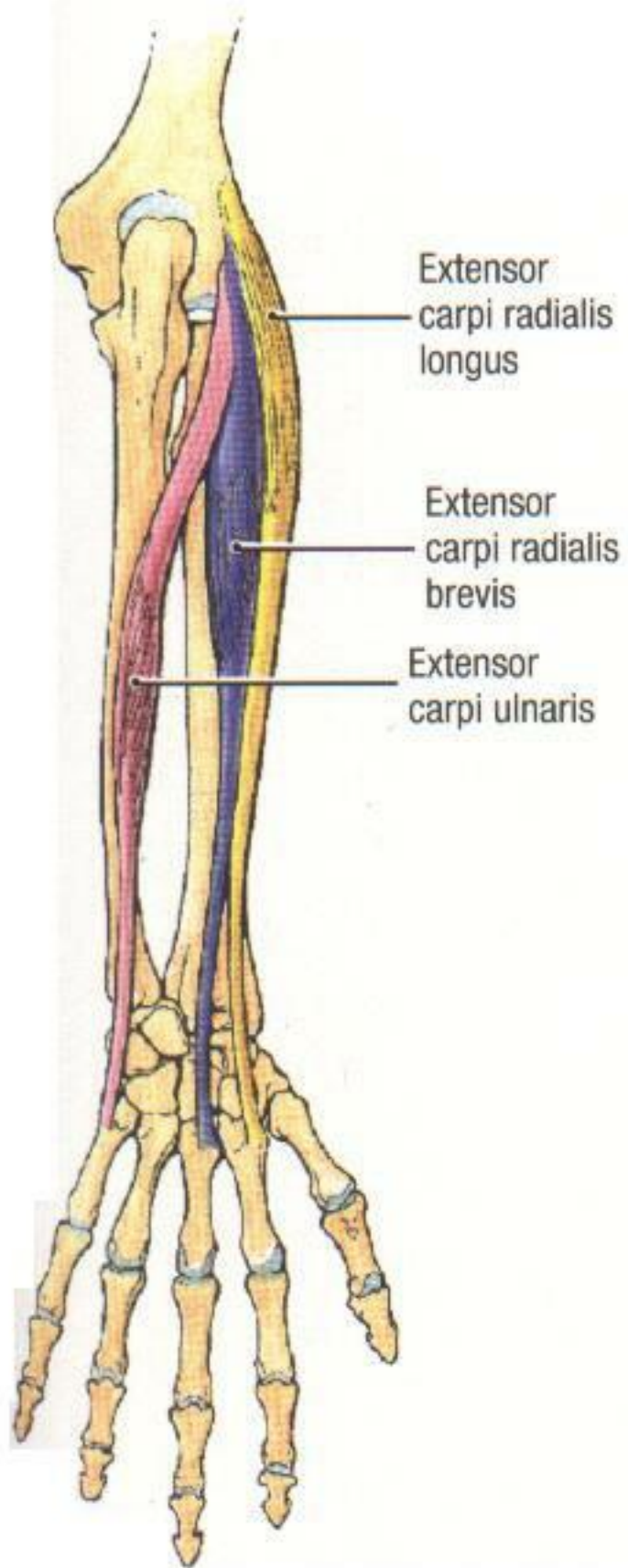
2nd layer



3rd layer



4th layer



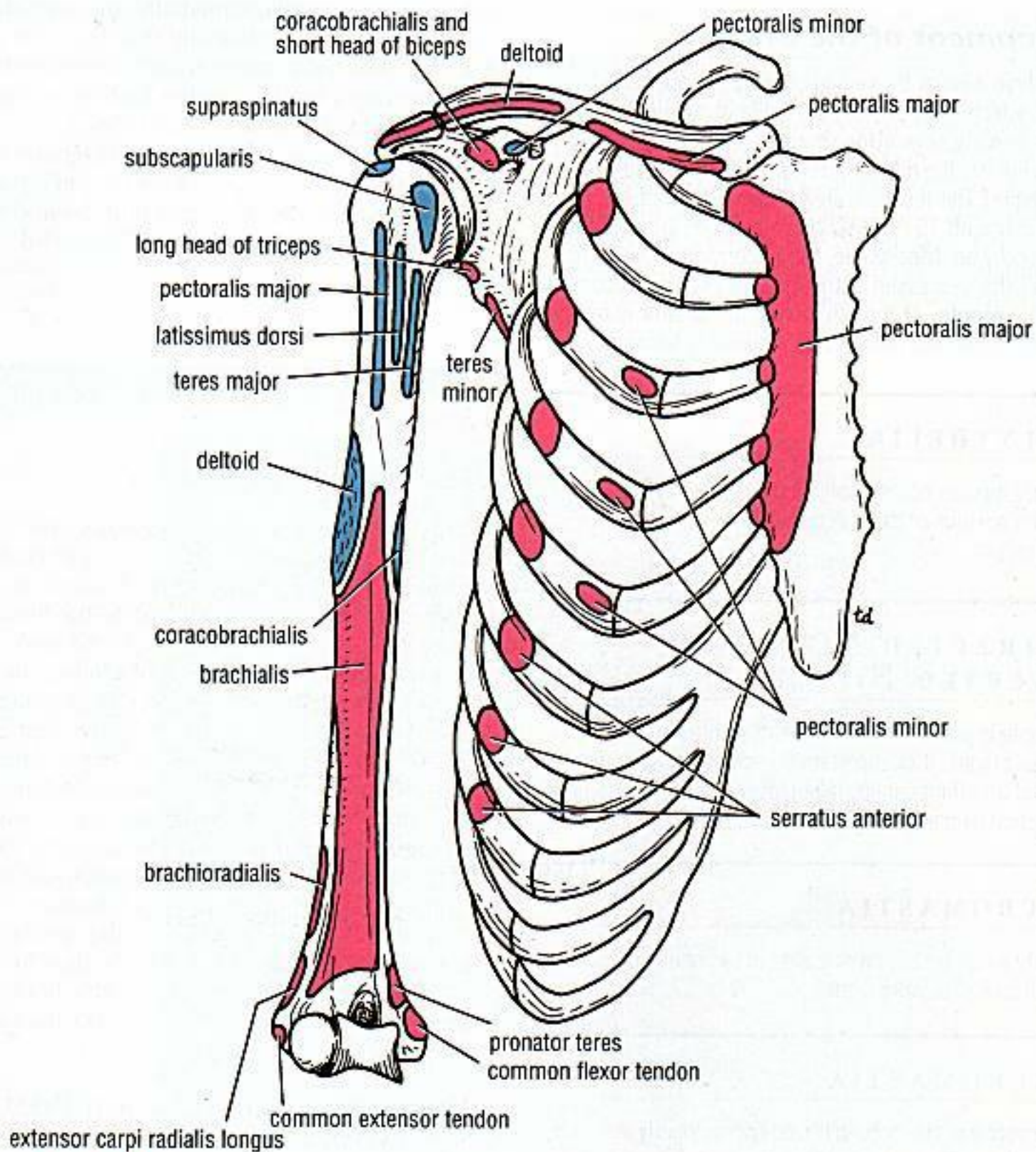


Figure 9-5 Muscle attachments to the bones of the thorax, clavicle, scapula, and humerus.

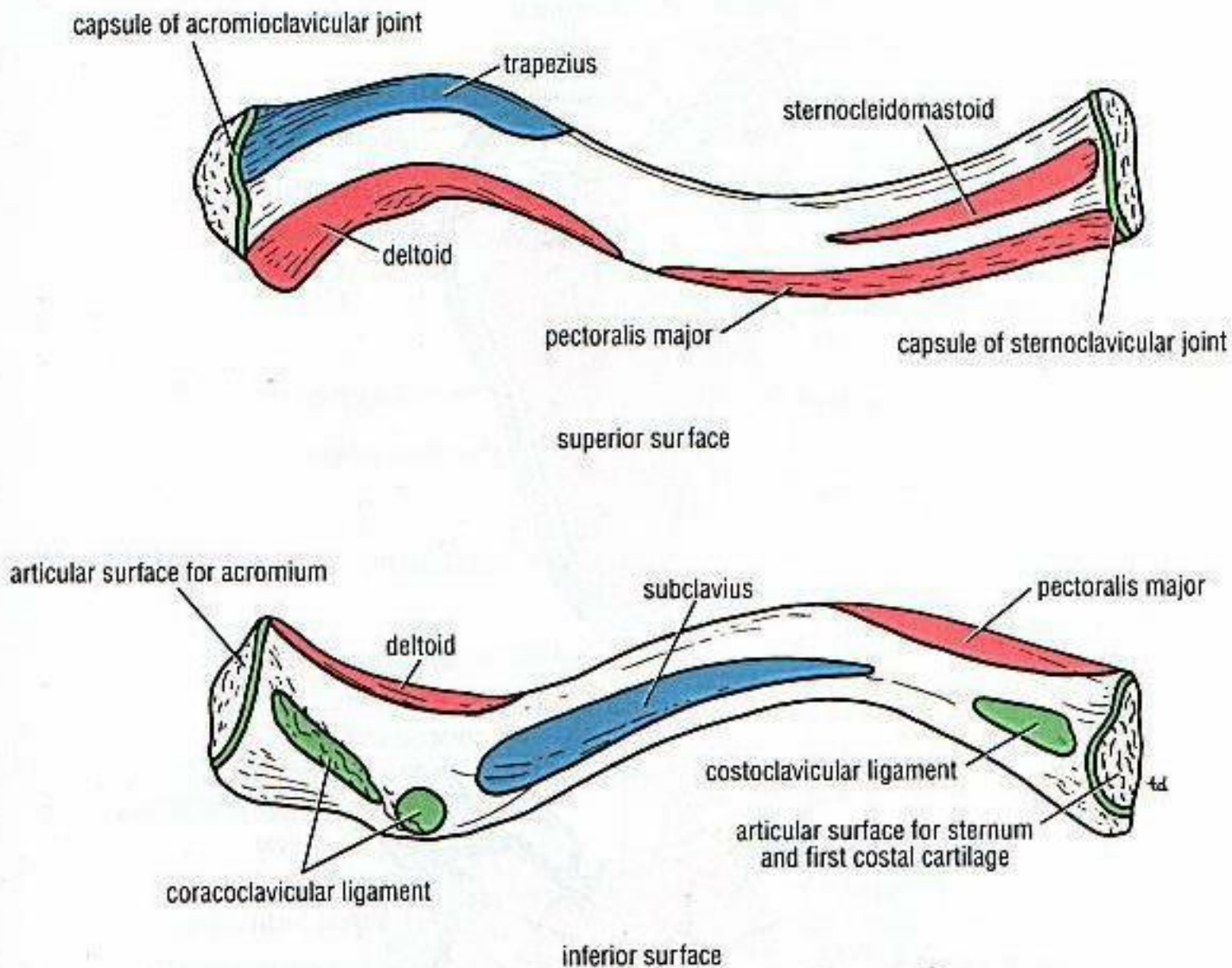


Figure 9-6 Important muscular and ligamentous attachments to the right clavicle.

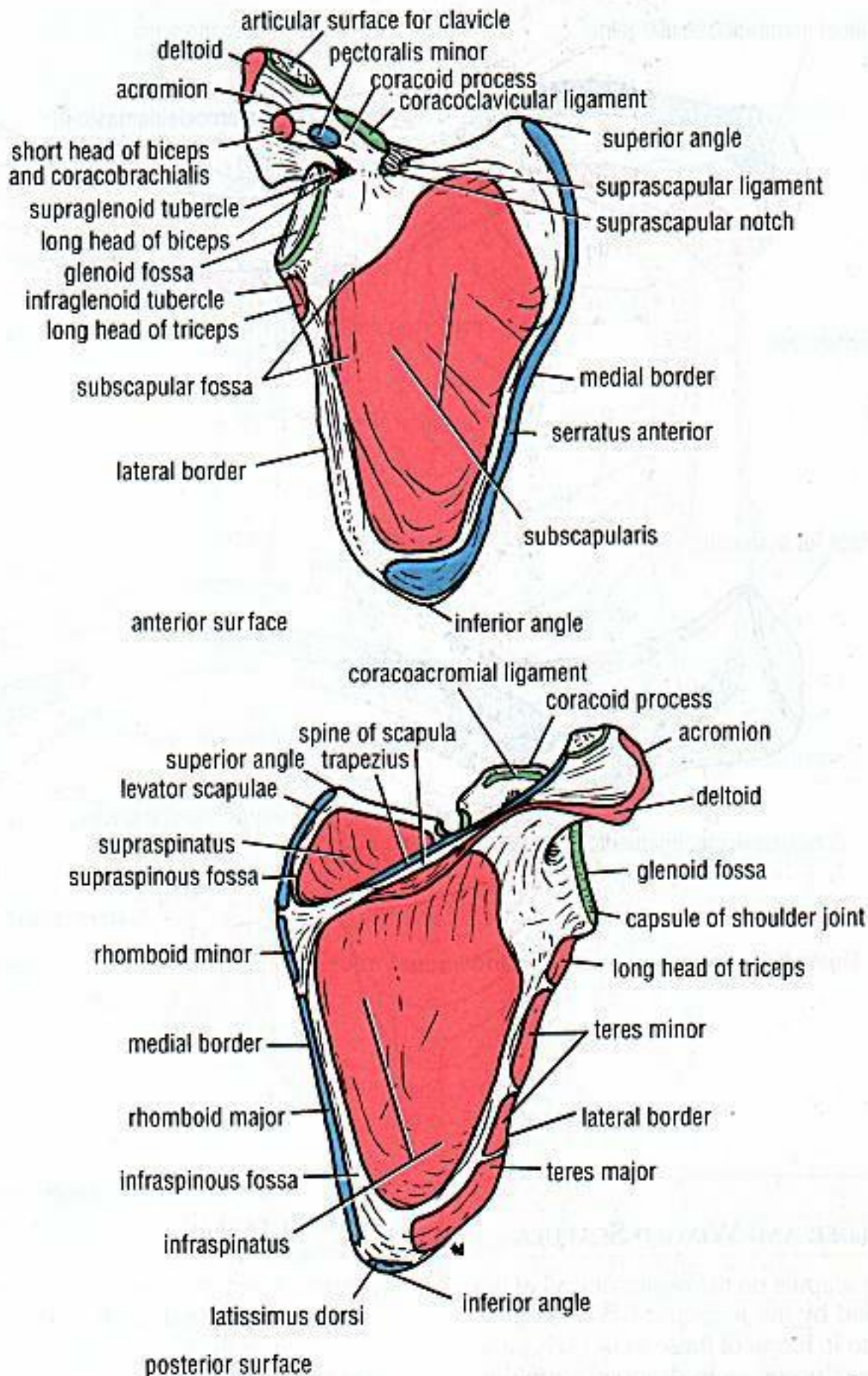


Figure 9-7 Important muscular and ligamentous attachments to the right scapula.

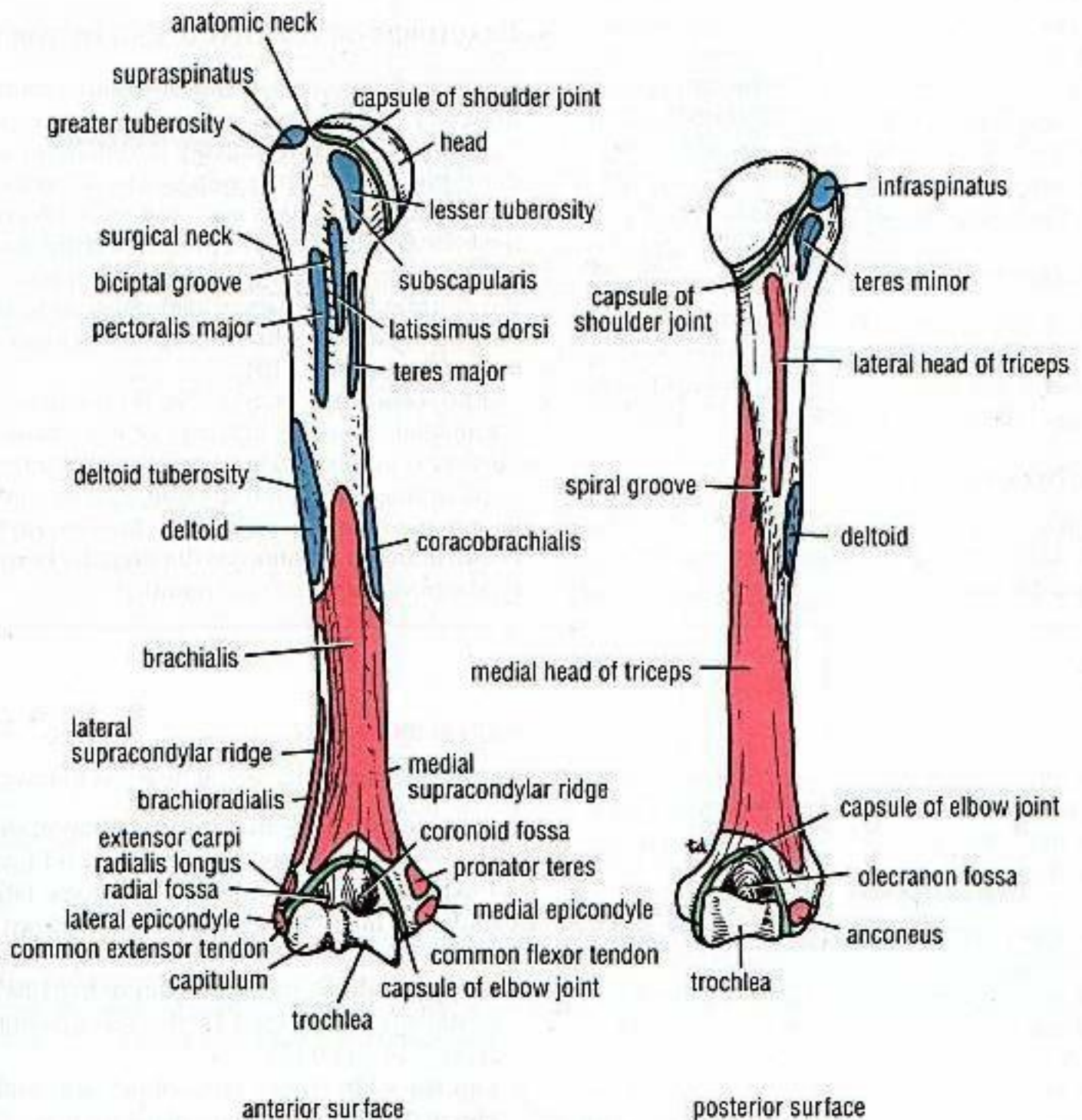


Figure 9-9 Important muscular and ligamentous attachments to the right humerus.

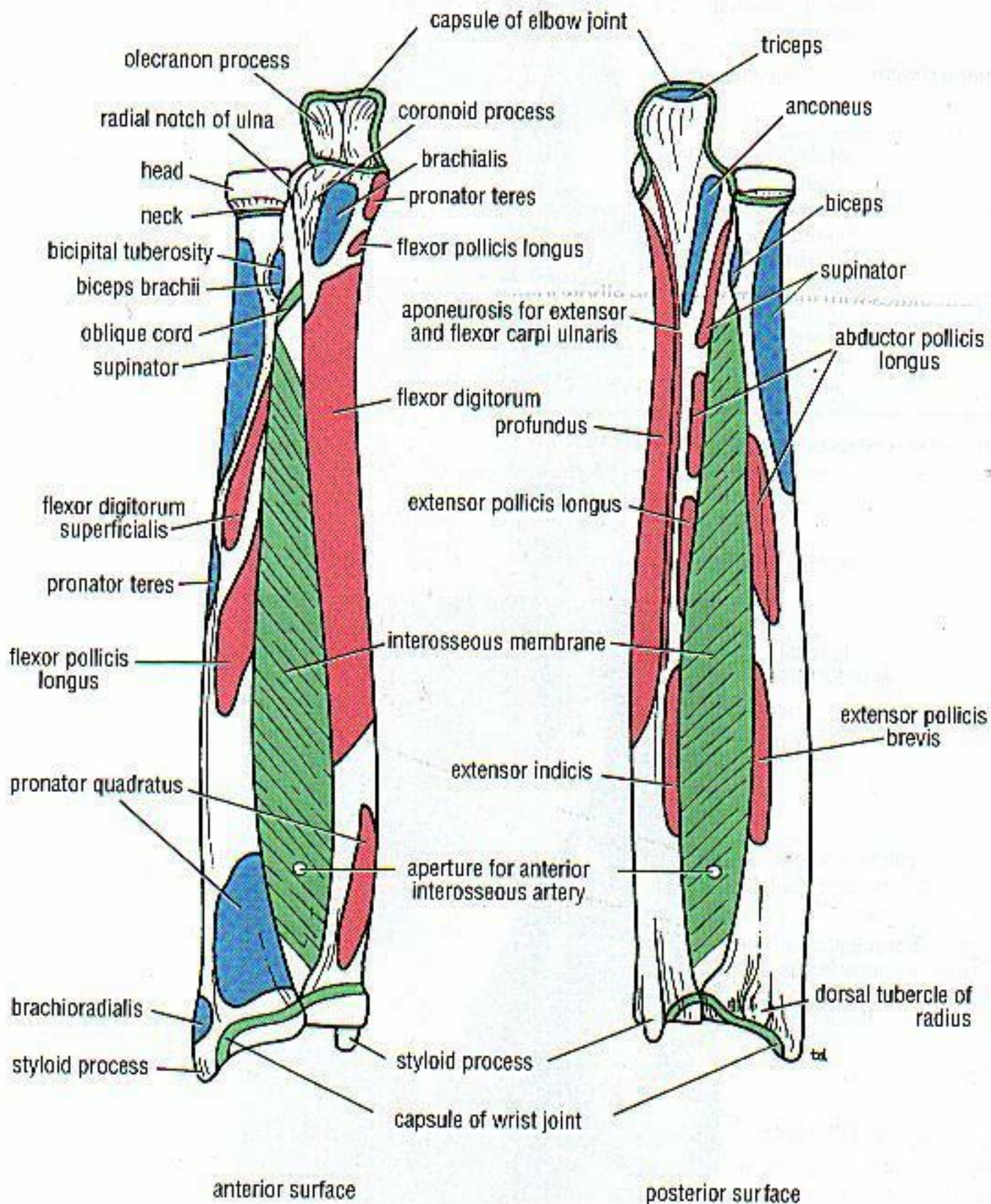


Figure 9-48 Important muscular and ligamentous attachments to the radius and the ulna.

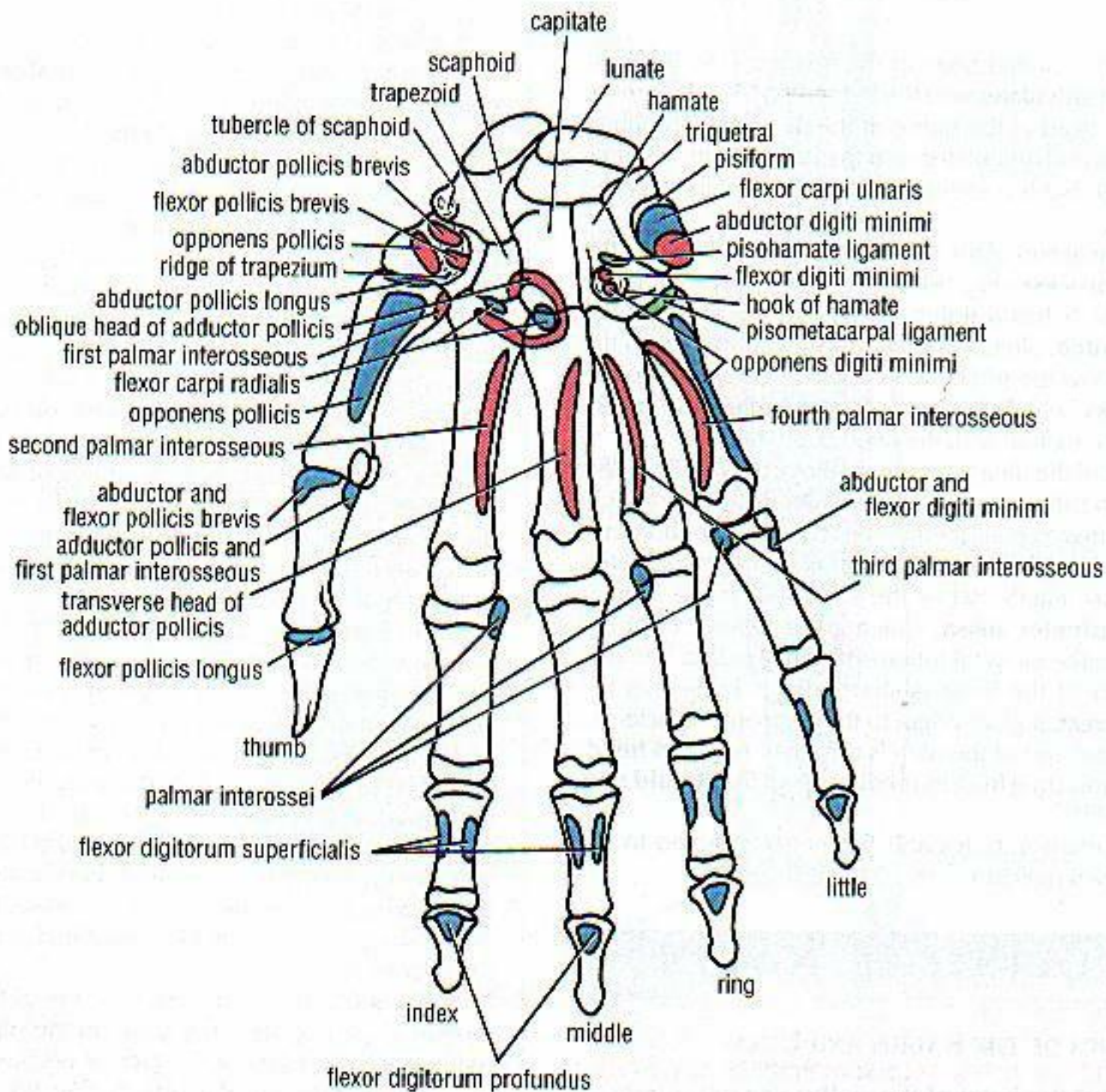


Figure 9-50 Important muscular attachments to the anterior surfaces of the bones of the hand.

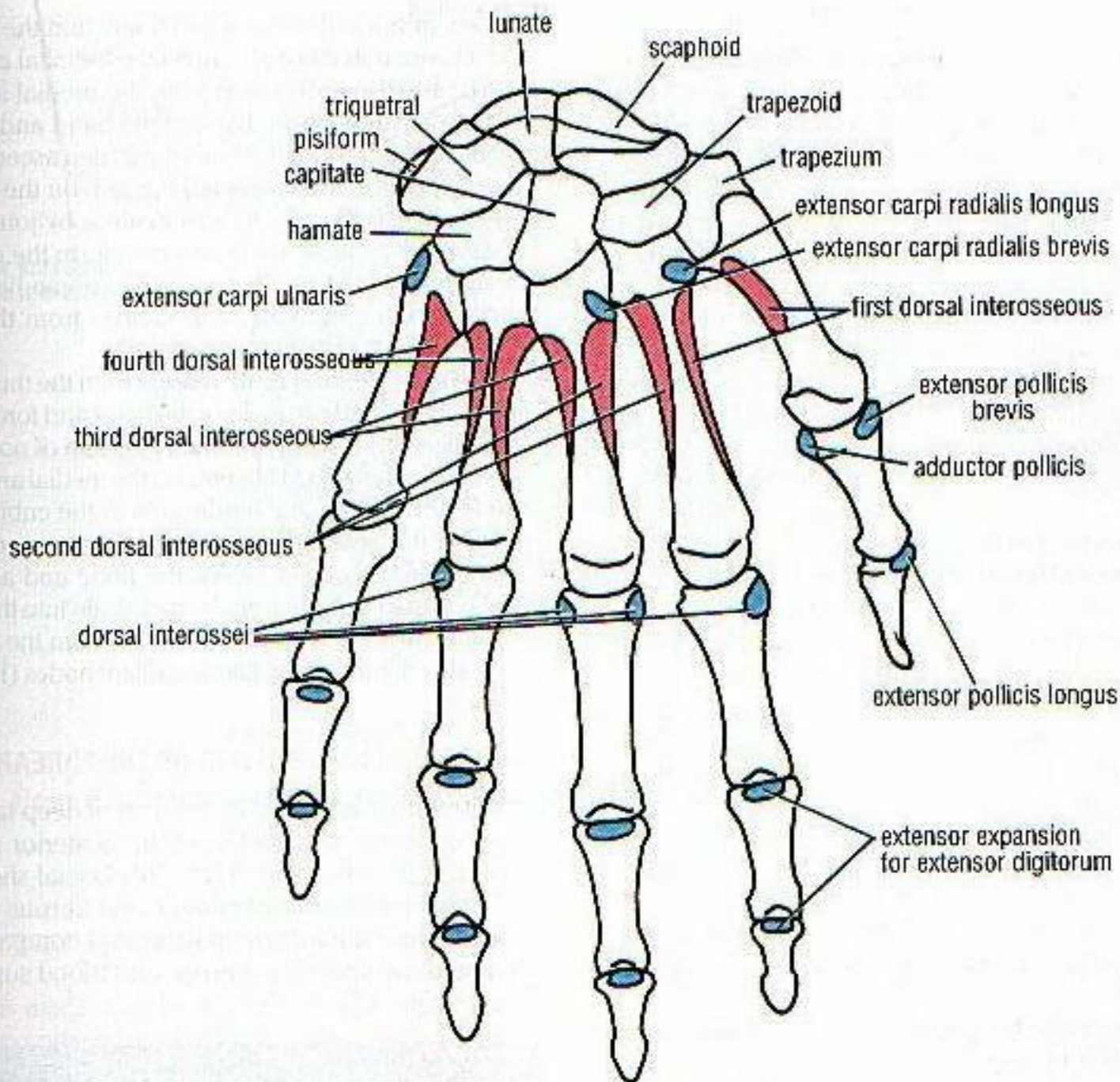
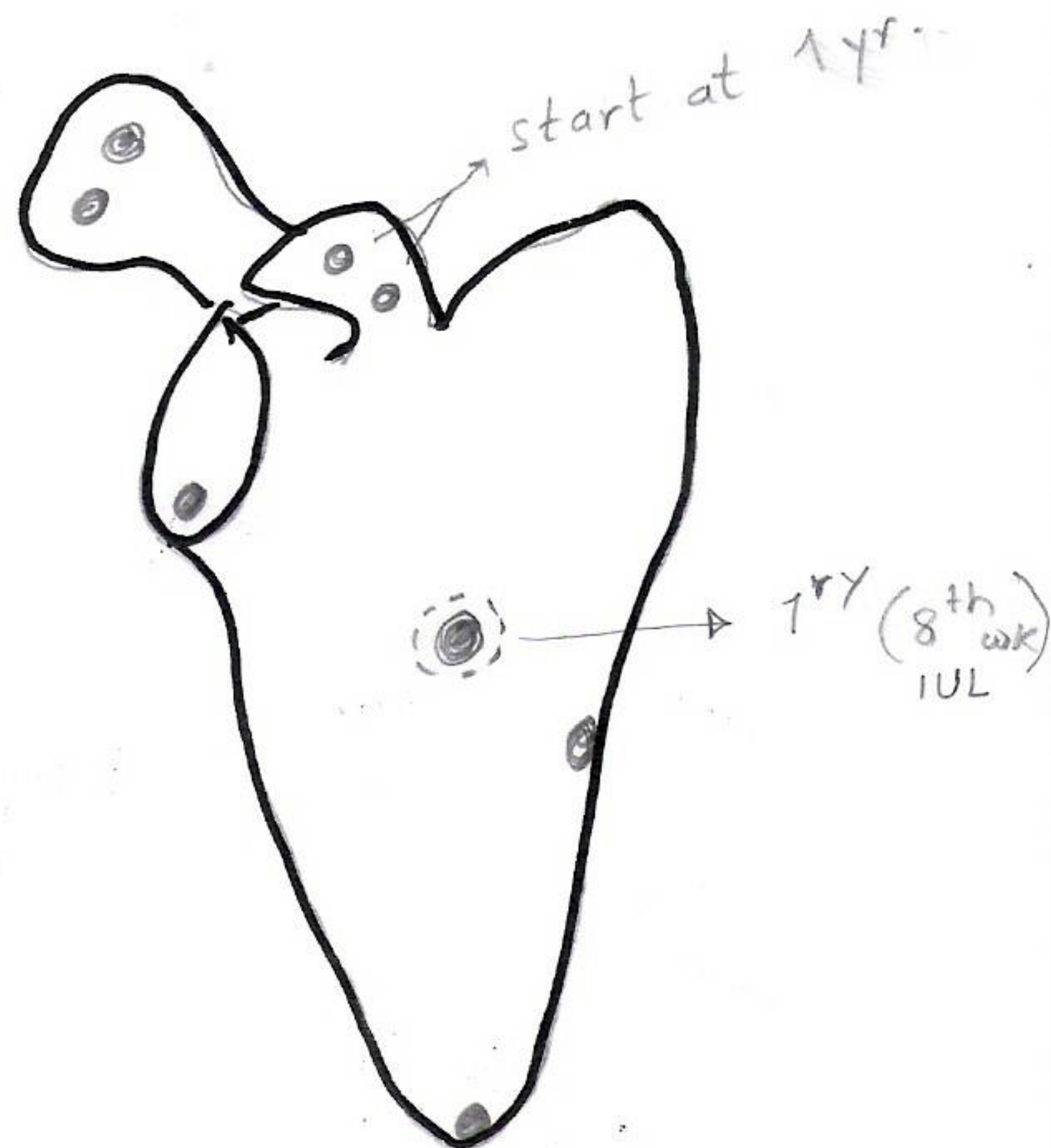
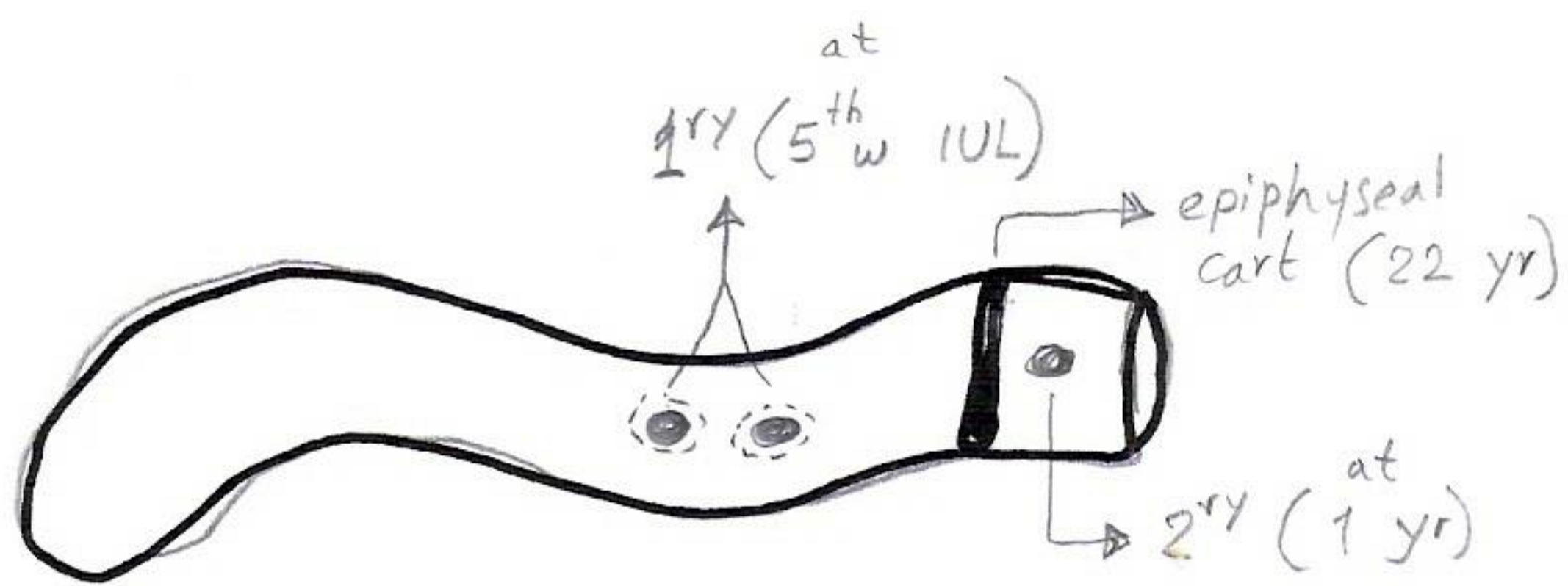
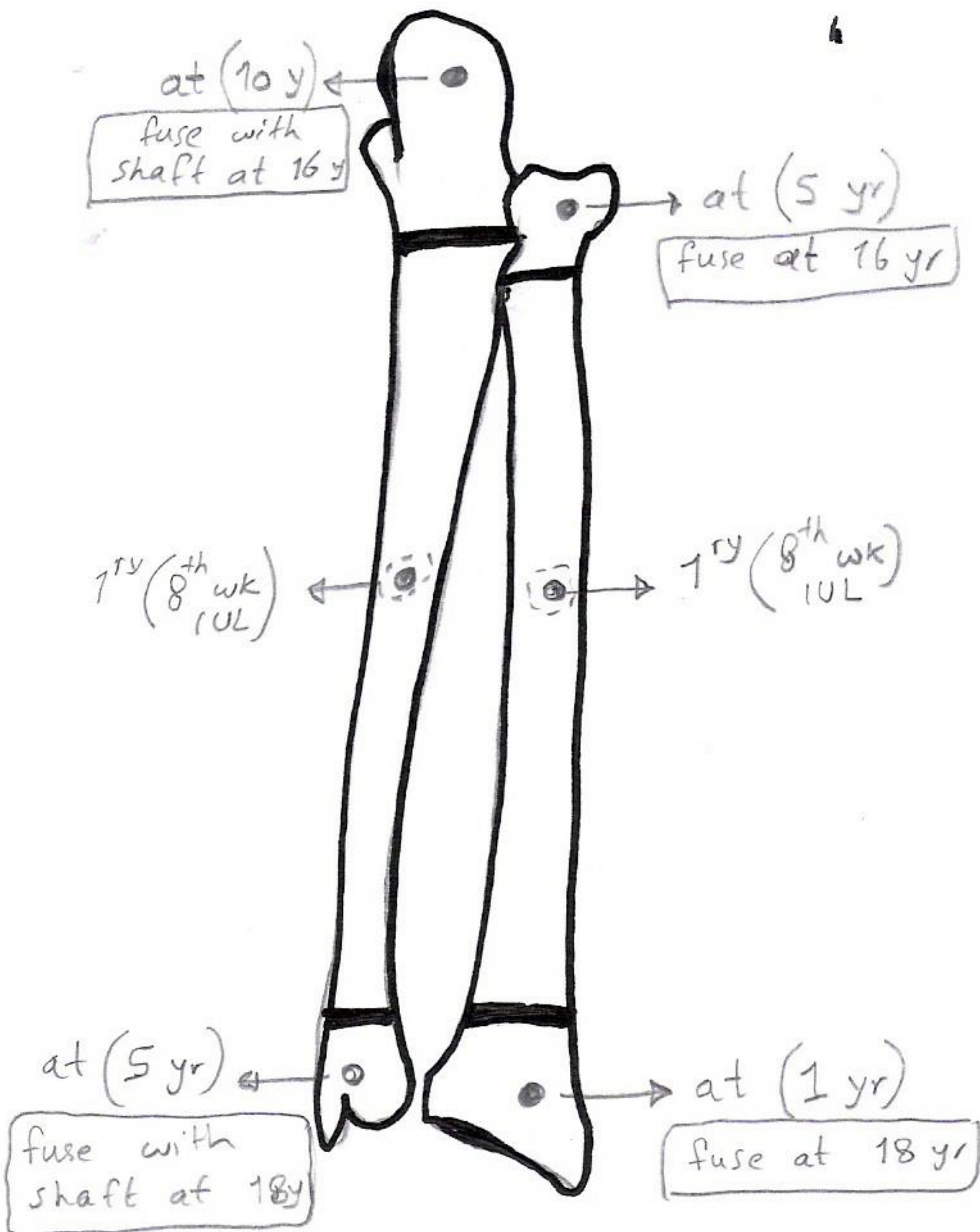
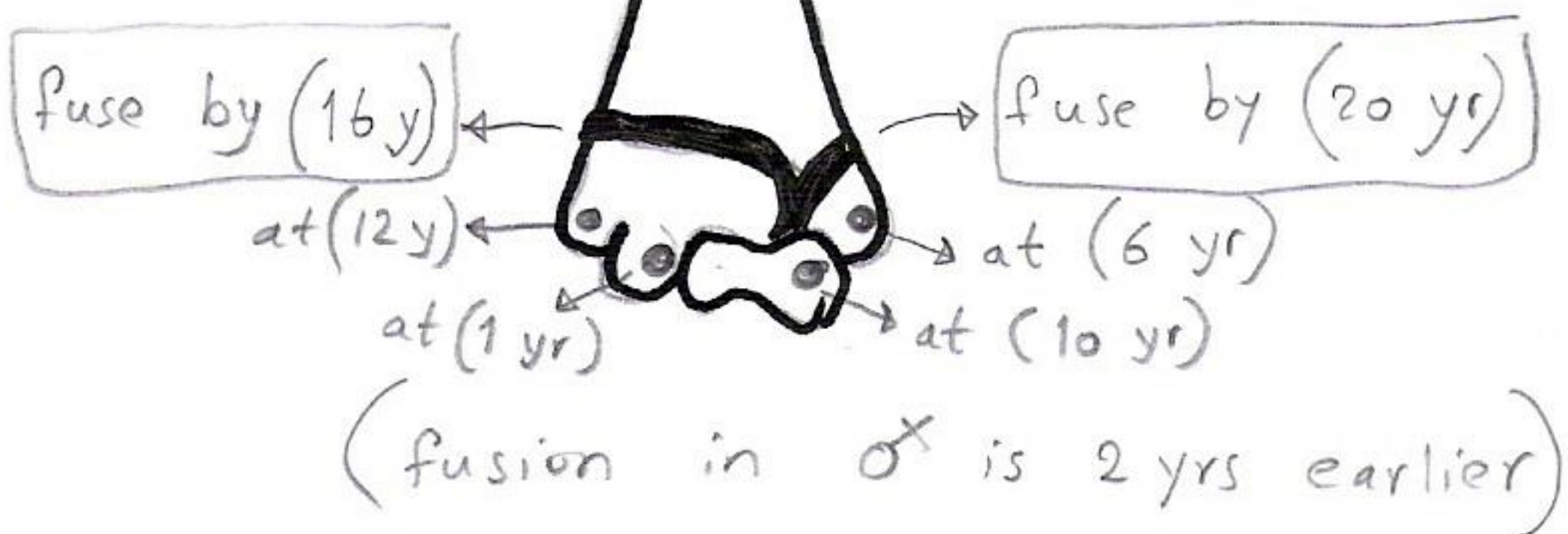
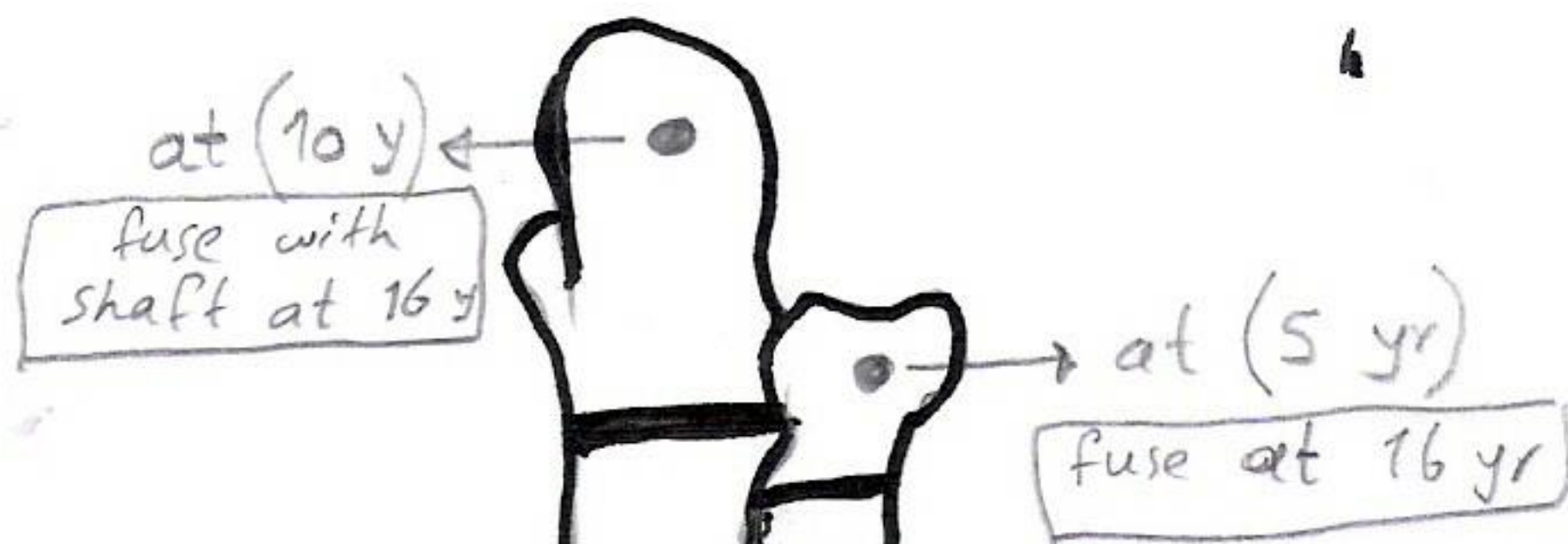
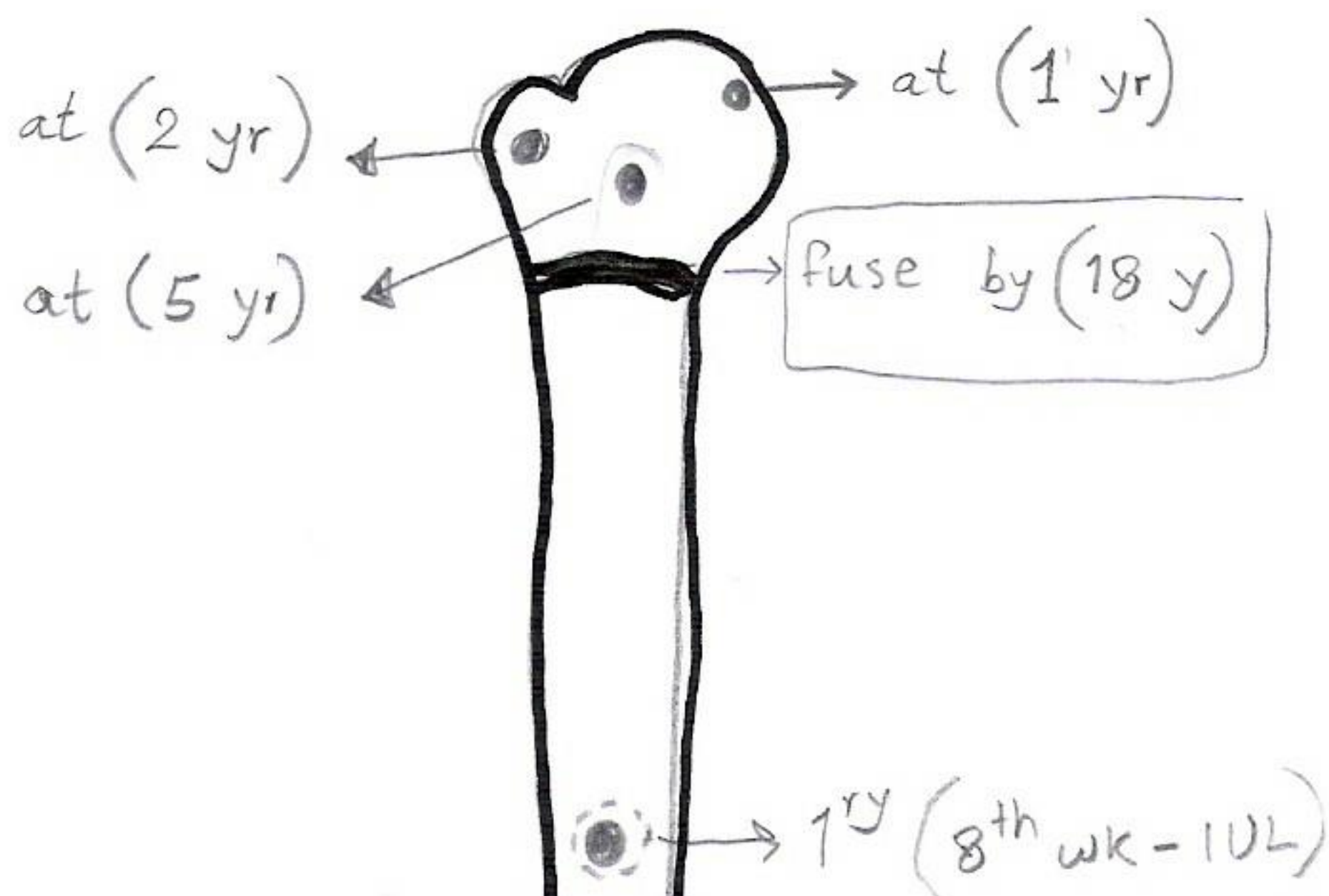
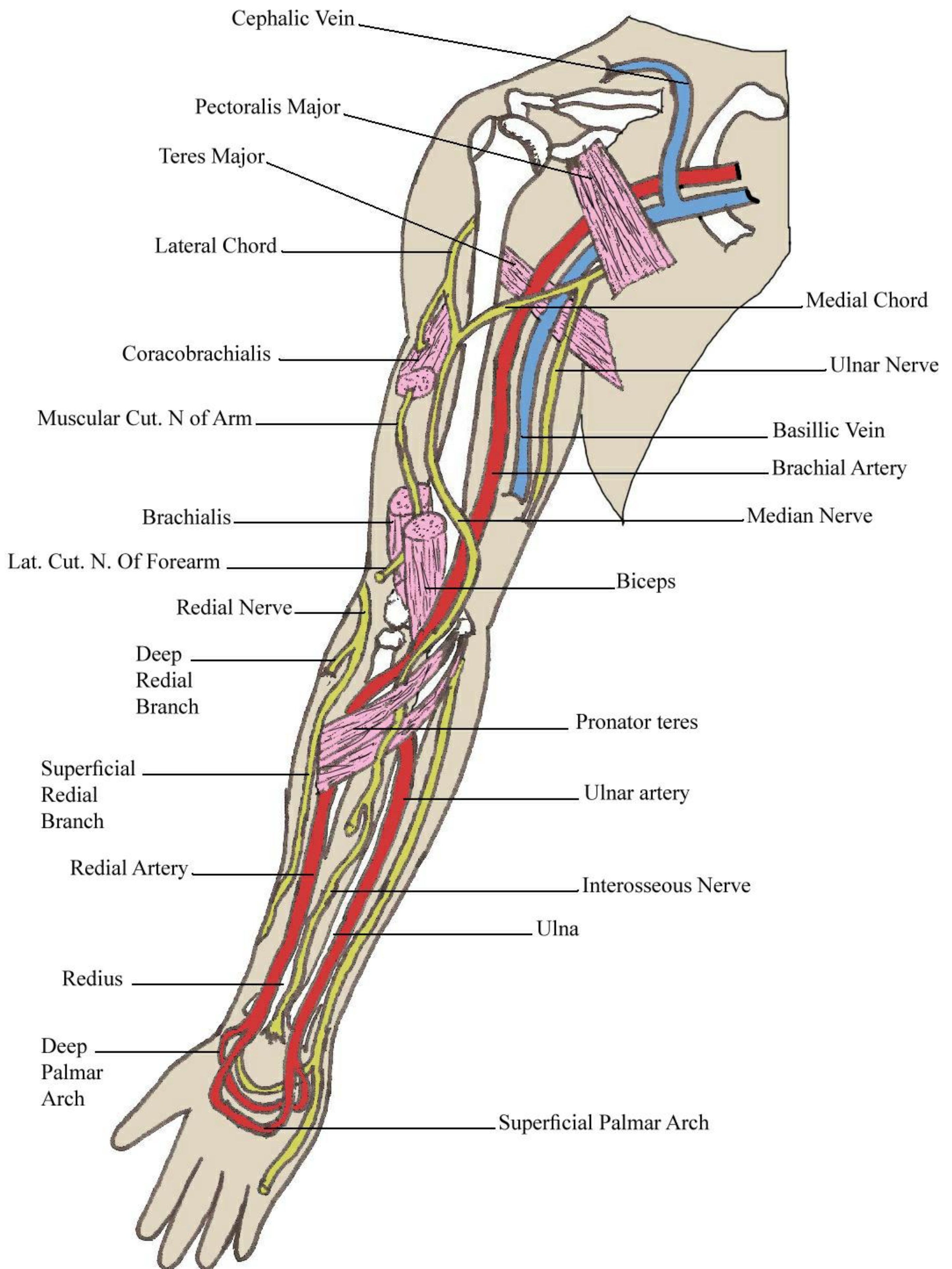


Figure 9-51 Important muscular attachments to the posterior surfaces of the bones of the hand.



2nd complete by 20 yrs
2nd appear at puberty





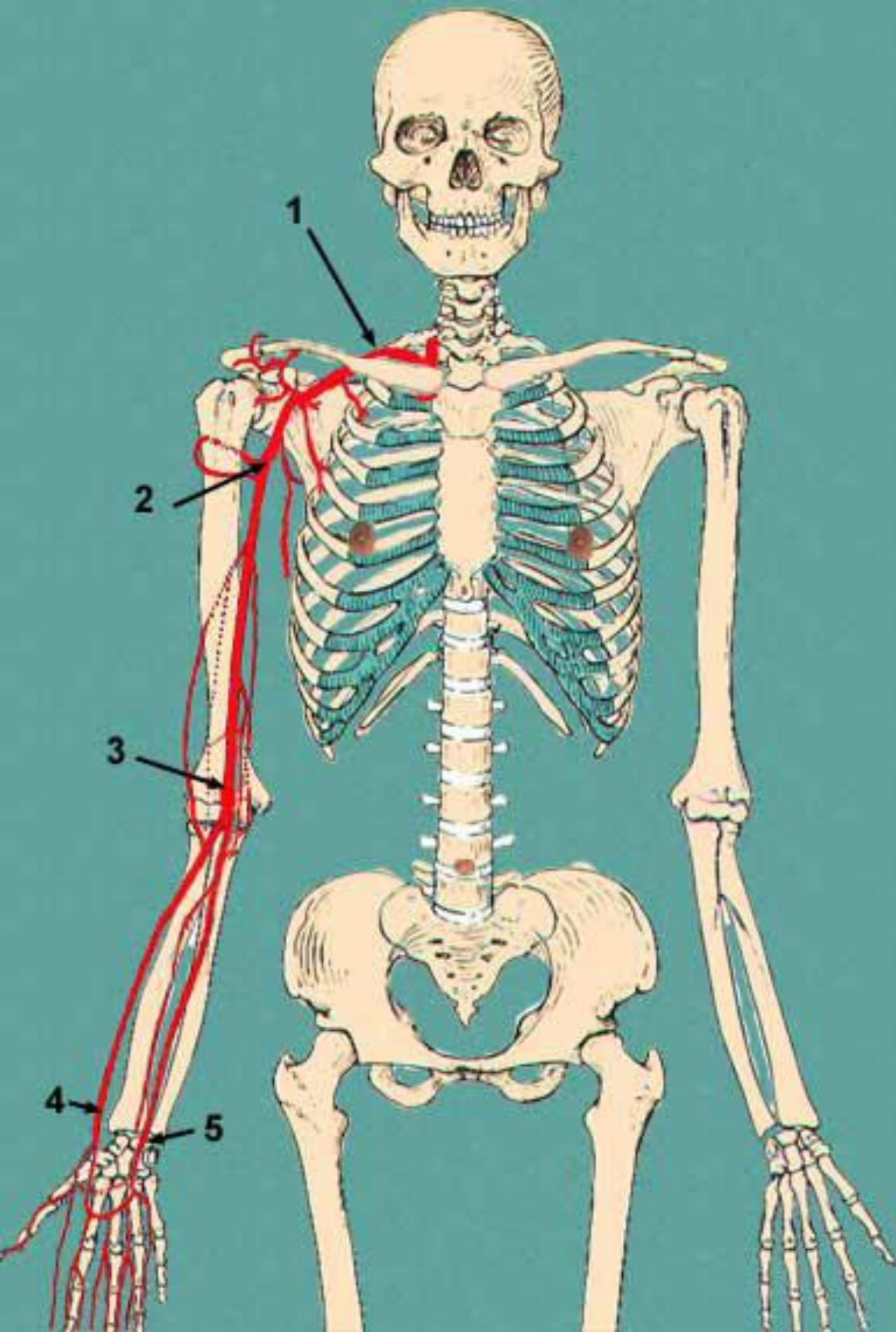




Fig. 17.6 The beer-drinker's nerve — C5. This supplies the abductors of the shoulder, the flexors of the elbow and the supinators. When C5, or the upper trunk of the brachial plexus, is damaged, the upper limb will be adducted at the shoulder, the elbow extended and the forearm pronated — the 'waiter's tip' position. The three glasses are just to remind you of the arrangement of the three constrictors of the pharynx (p. 324).

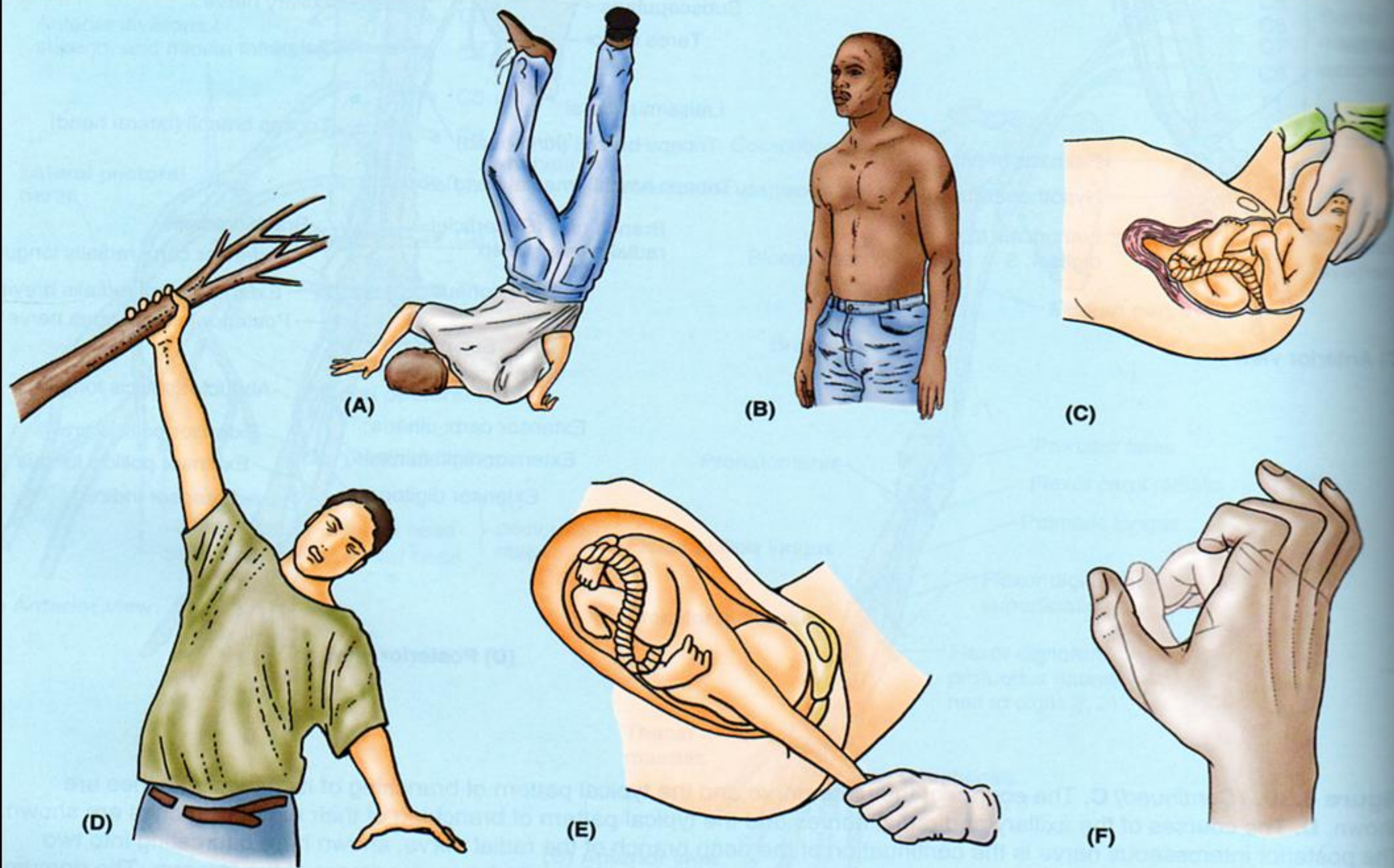


Figure B6.12. Injuries to brachial plexus. **A.** Note the excessive increase in the angle between the head and the left shoulder. **B.** The waiter's tip position (left upper limb) is demonstrated. **C.** Observe the excessive increase in the angle between the head and the left shoulder during this delivery. **D and E.** Excessive increases in the angle between the trunk and the right upper limb are demonstrated. **F.** A claw hand is shown (person is attempting to assume lightly shaded "fist" position).

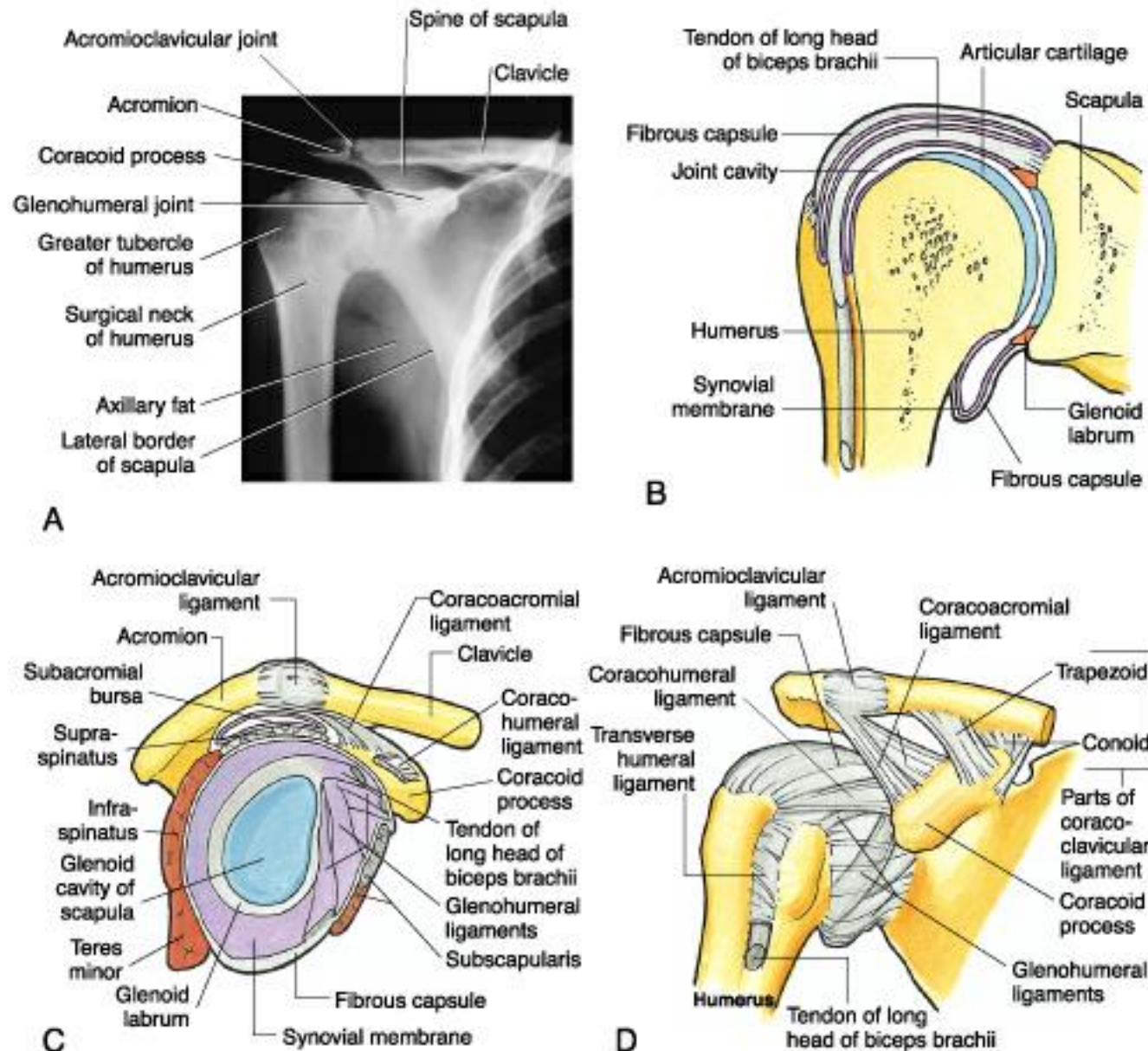
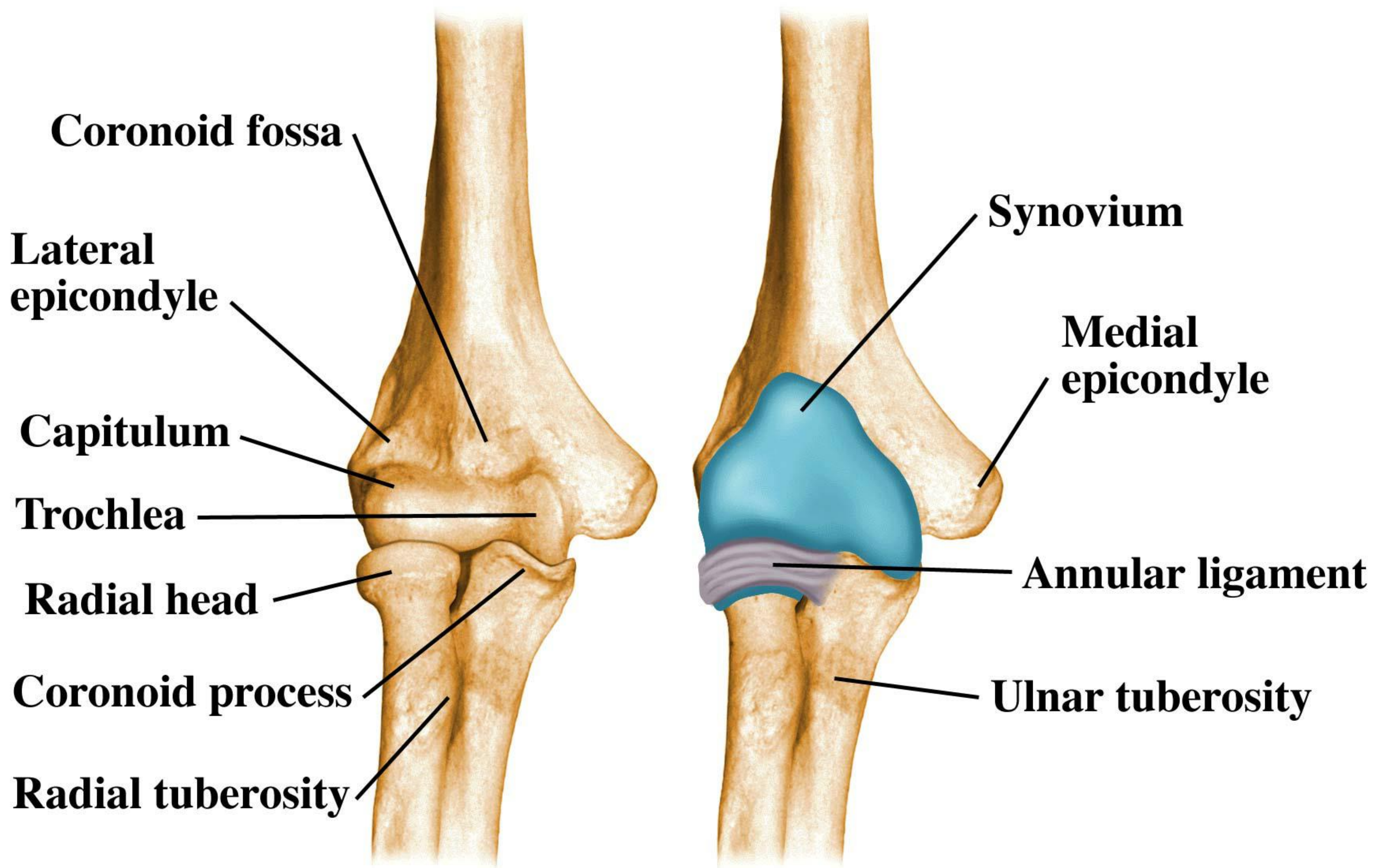
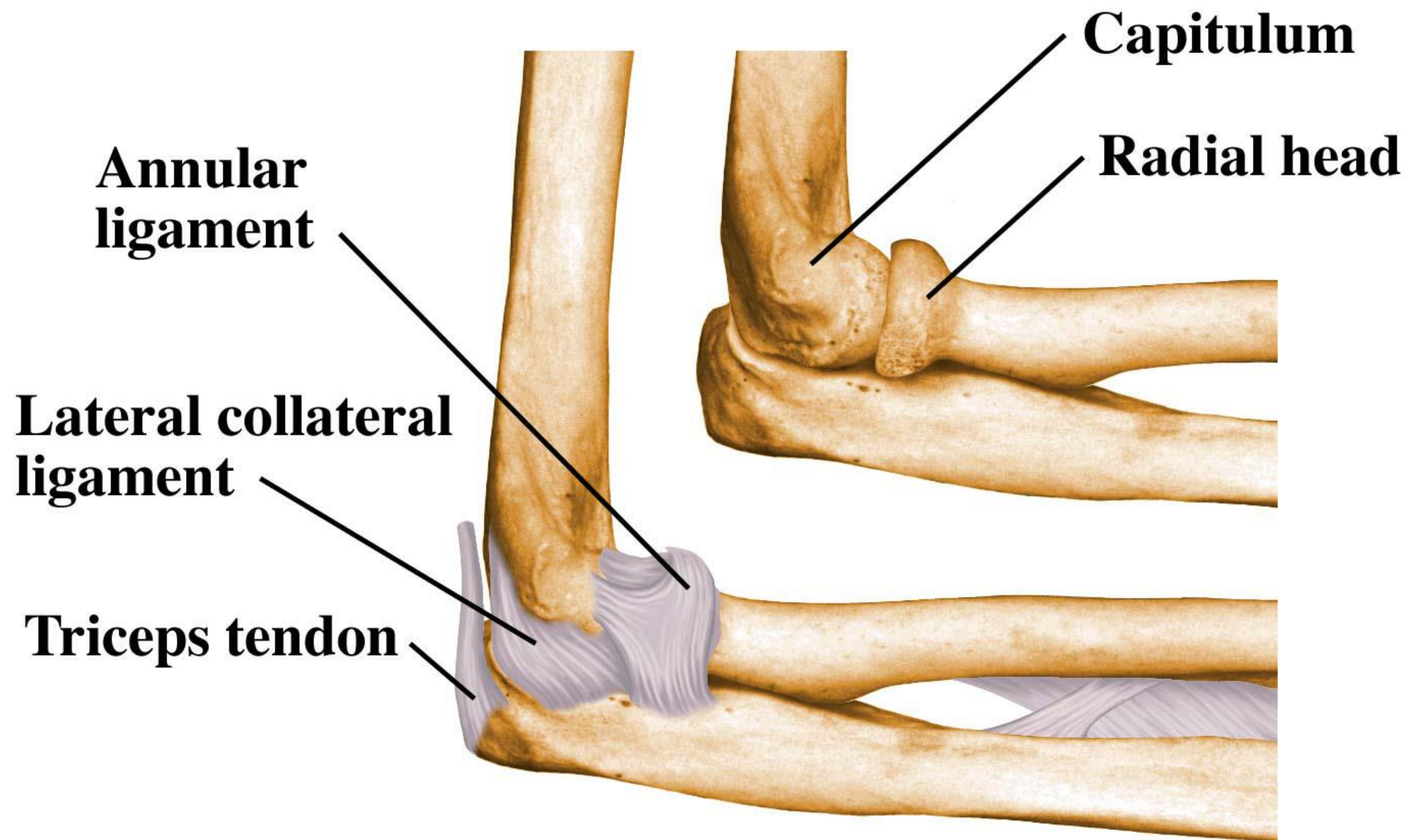
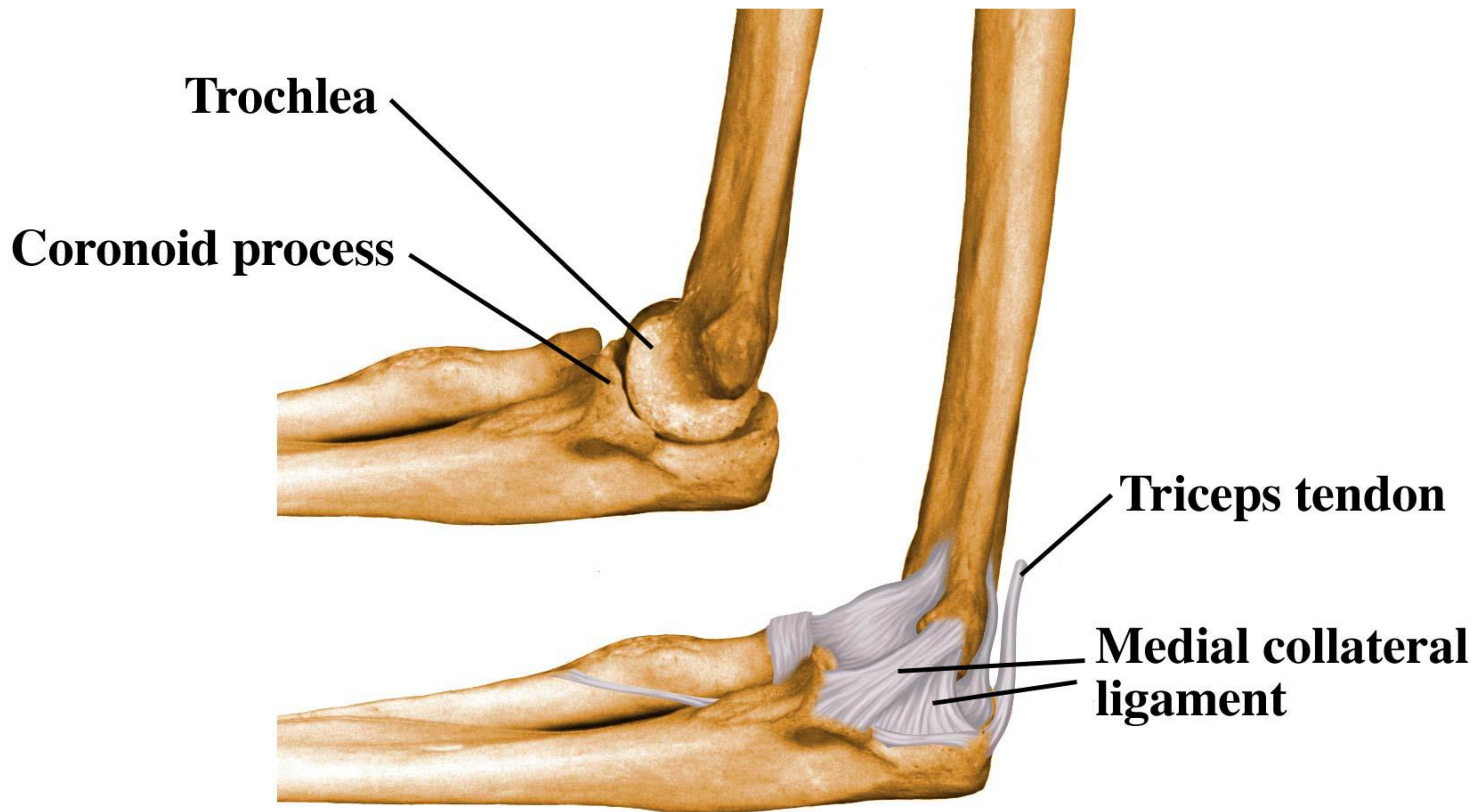


FIGURE 7.32 Glenohumeral and acromioclavicular joints. **A.** Radiograph of the glenohumeral and acromioclavicular joints. **B.** Coronal section illustrating the articulating bones and articular capsule of the glenohumeral joint. **C.** Lateral view of the scapula showing the glenoid cavity and the glenohumeral ligaments. **D.** Ligaments of the glenohumeral and SC joints. Anterior view.







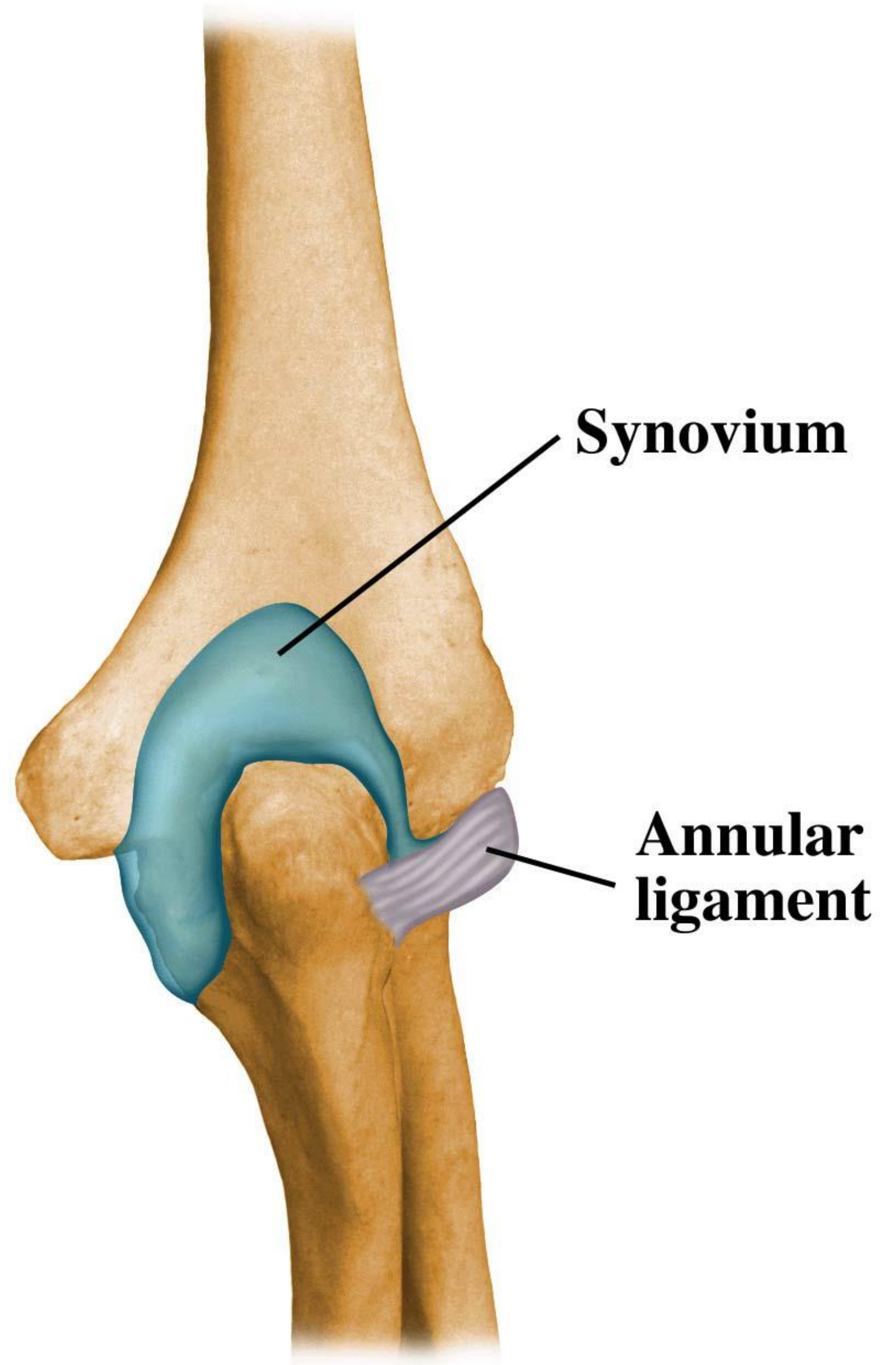
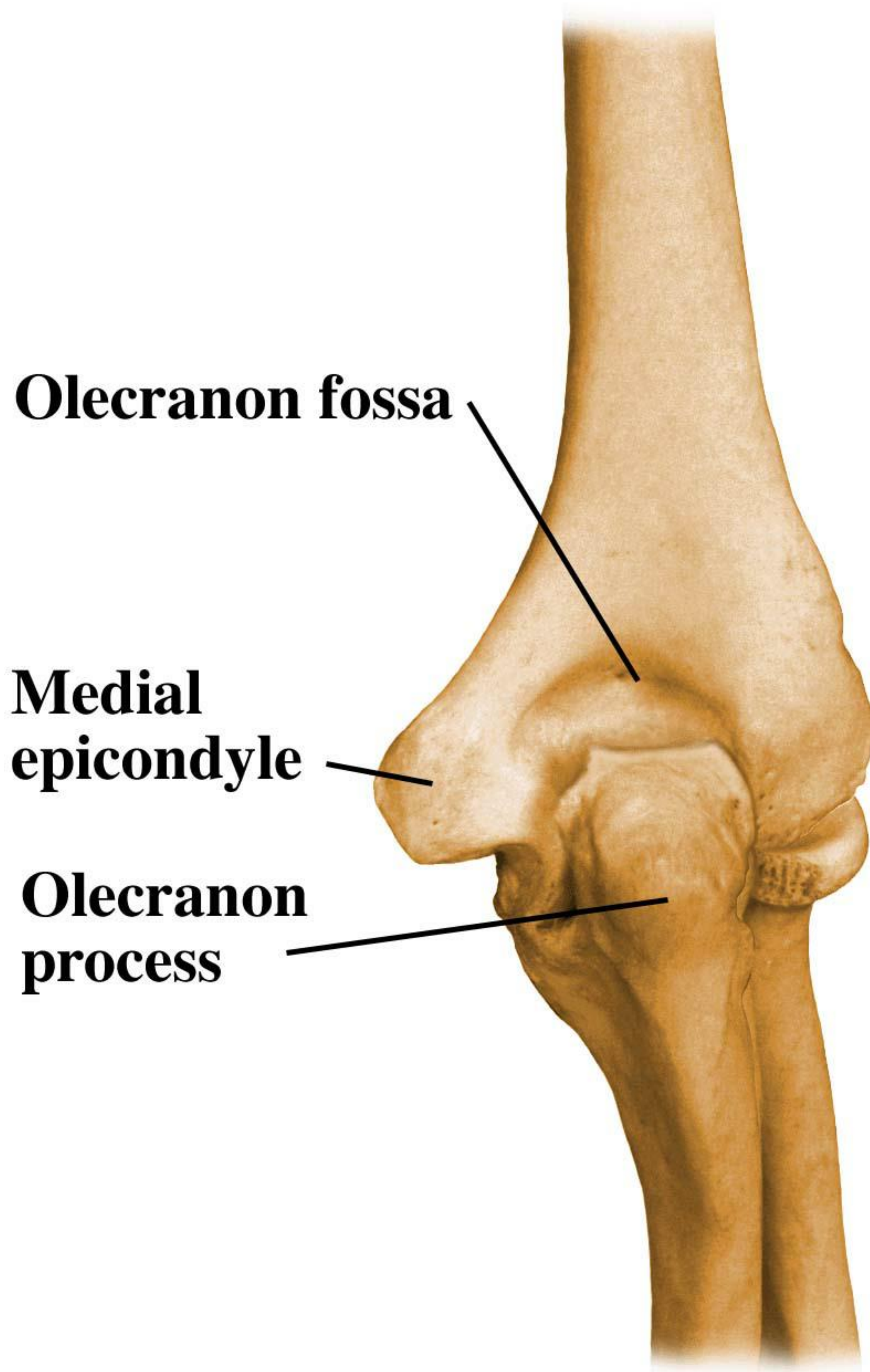
Olecranon fossa

**Medial
epicondyle**

**Olecranon
process**

Synovium

**Annular
ligament**



Upper Brachial Plexus Injuries

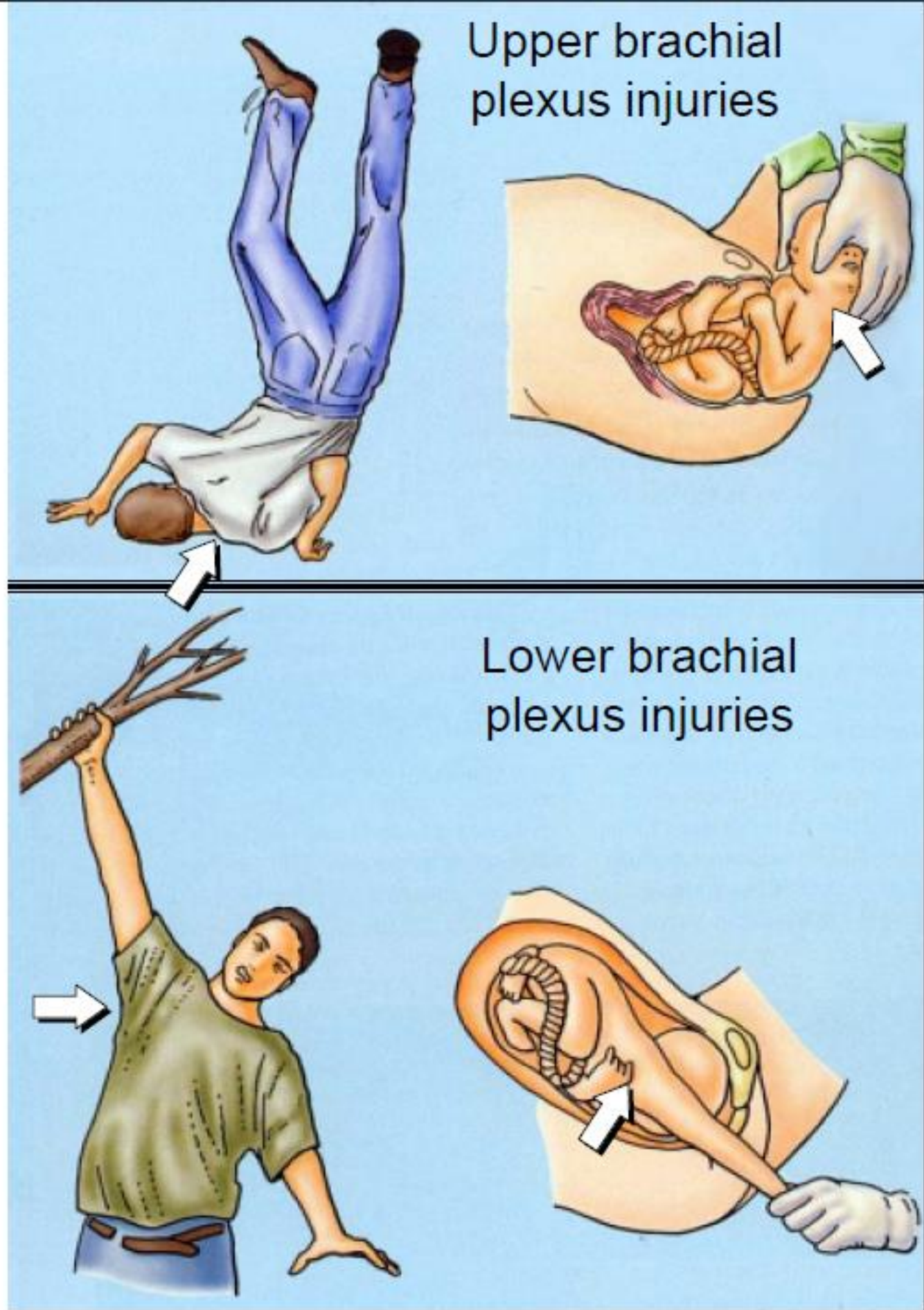
- Increase in angle between neck & shoulder
- Traction (stretching or avulsion) of upper ventral rami (e.g., C5, C6)
- Produces Erb's Palsy

Lower Brachial Plexus Injuries

- Excessive upward pull of limb
- Traction (stretching or avulsion) of lower ventral rami (e.g., C8, T1)
- Produces Klumpke's Palsy

"Obstetrical" or "Birth palsy"

- Becoming increasingly rare
- Categorized on basis of damage
 - Type I: Upper (C5,6), Erb's
 - Type II: All (C5-T1), both palsies
 - Type III: Lower (C8, T1), Klumpke's Palsy

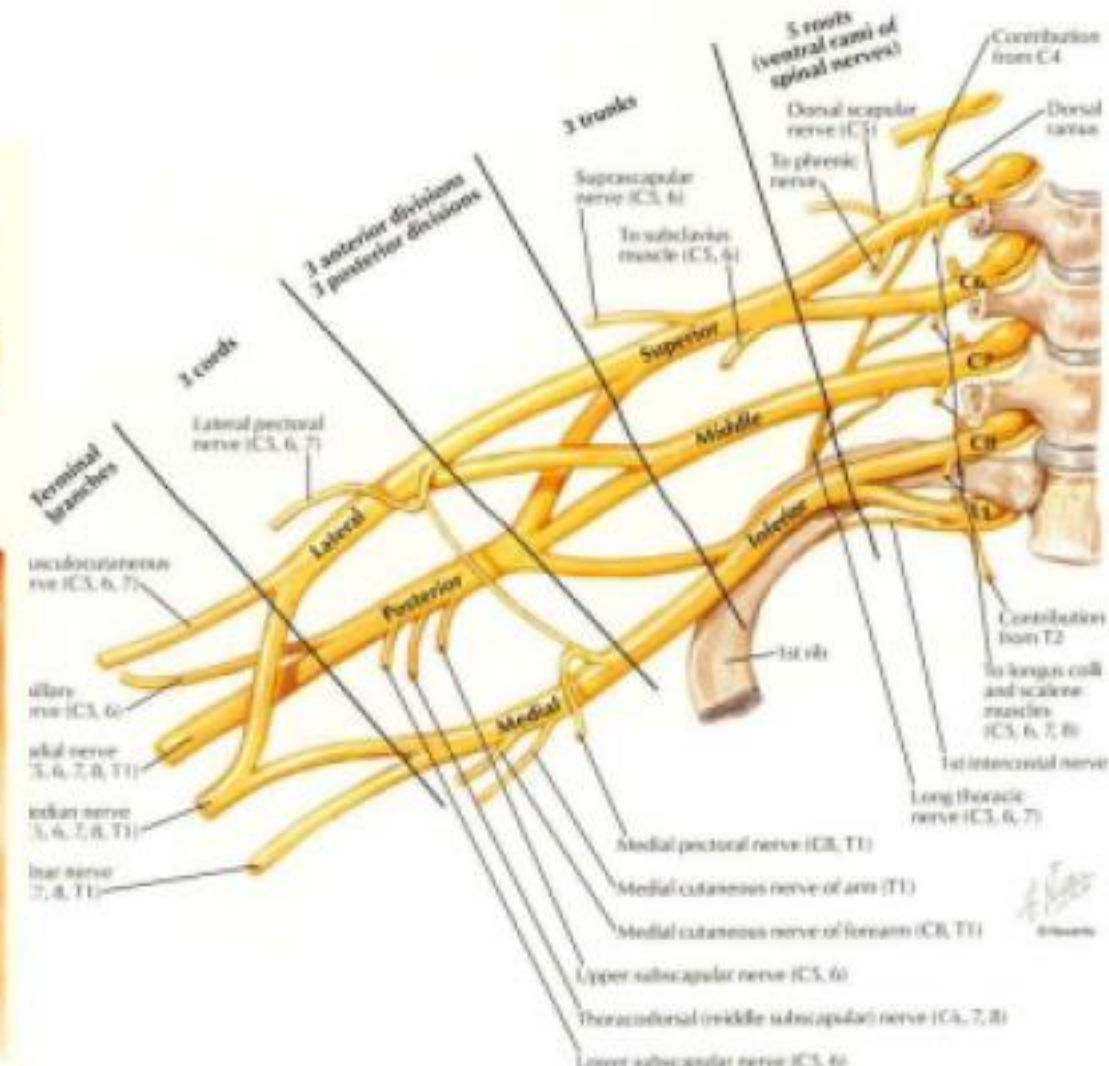
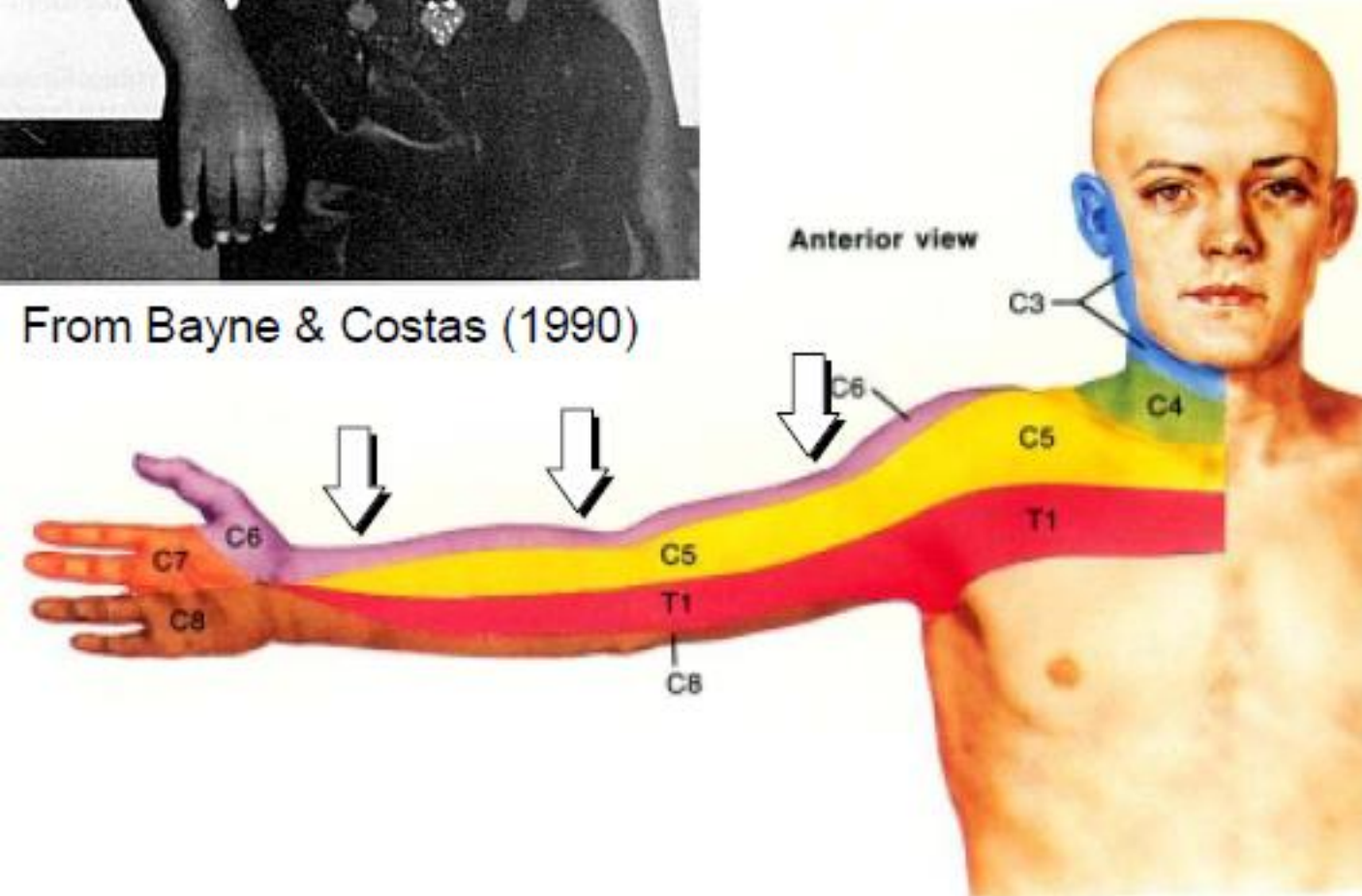


Upper Brachial Plexus Injury: Erb's Palsy

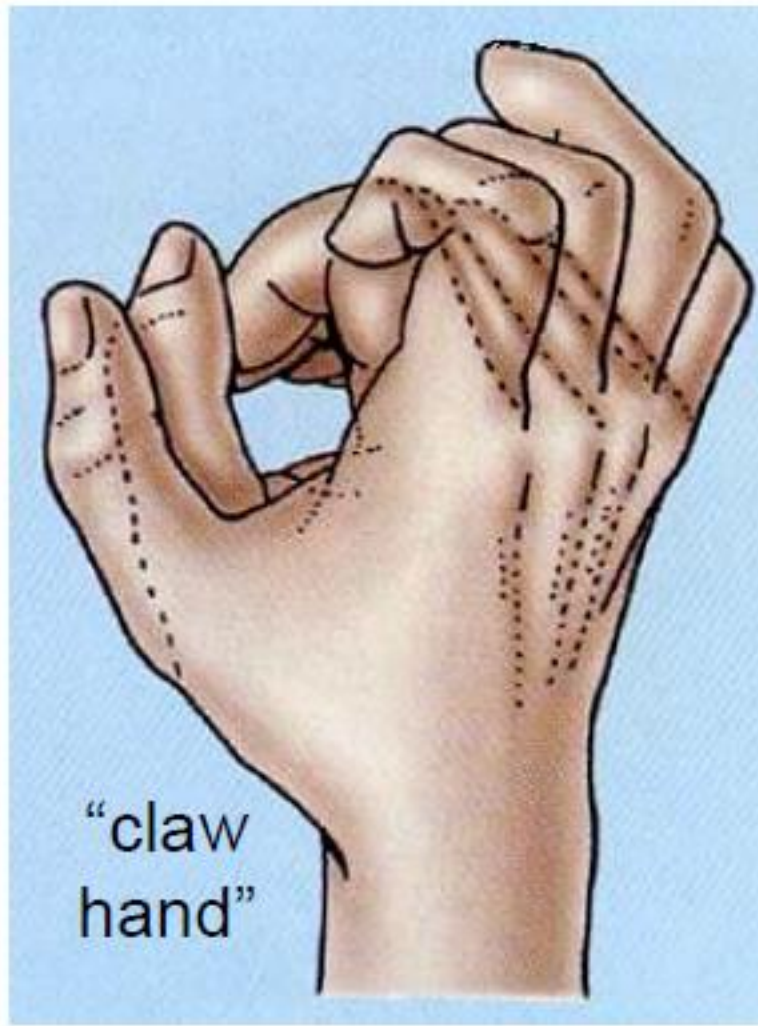


- Appearance: drooping, wasted shoulder; pronated and extended limb hangs limply (“waiter’s tip palsy”)
- Loss of innervation to abductors, flexors, & medial rotators of shoulder and flexors & supinators of elbow
- Loss of sensation to lateral aspect of upper extremity

From Bayne & Costas (1990)



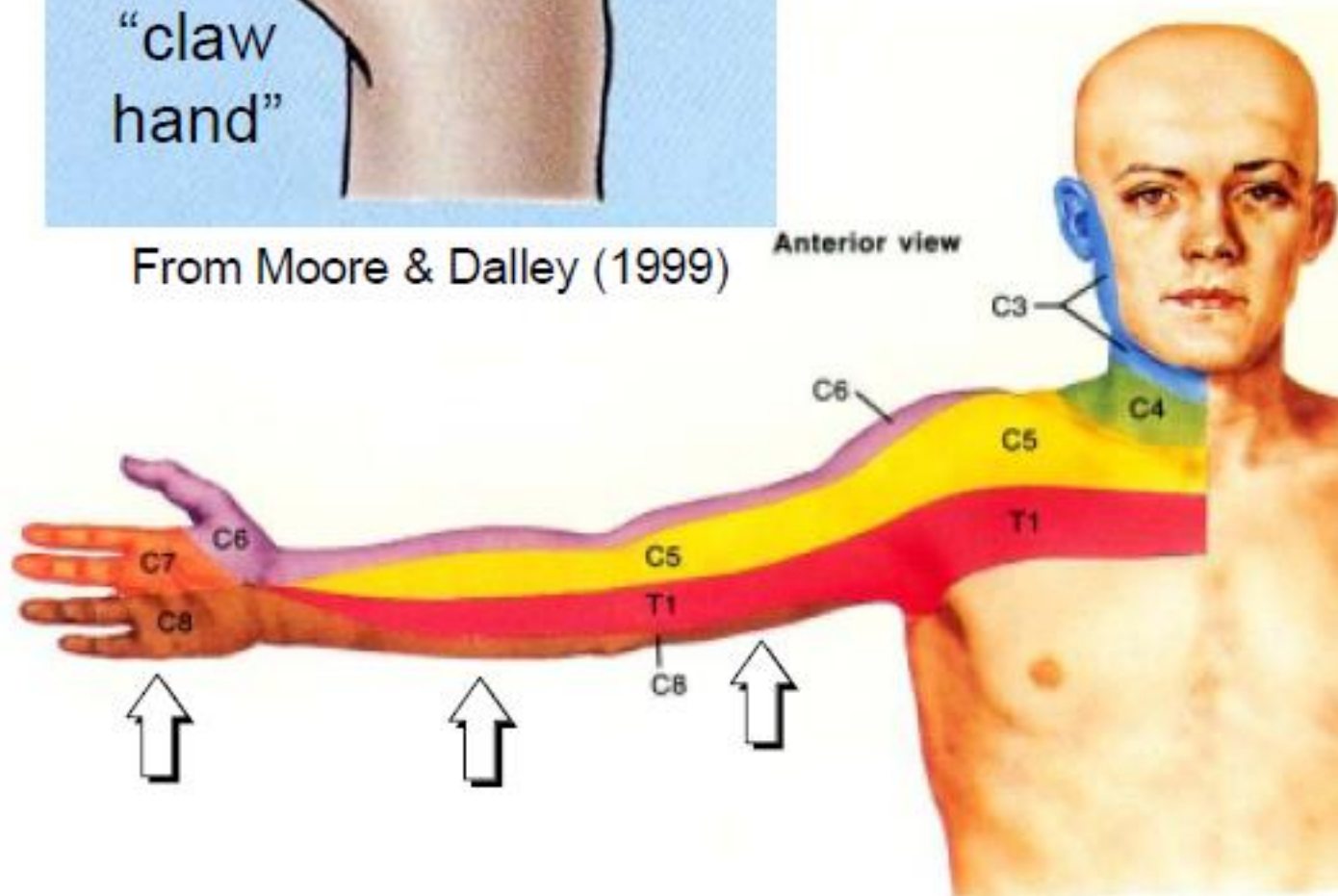
Lower Brachial Plexus Injury: Klumpke's Palsy



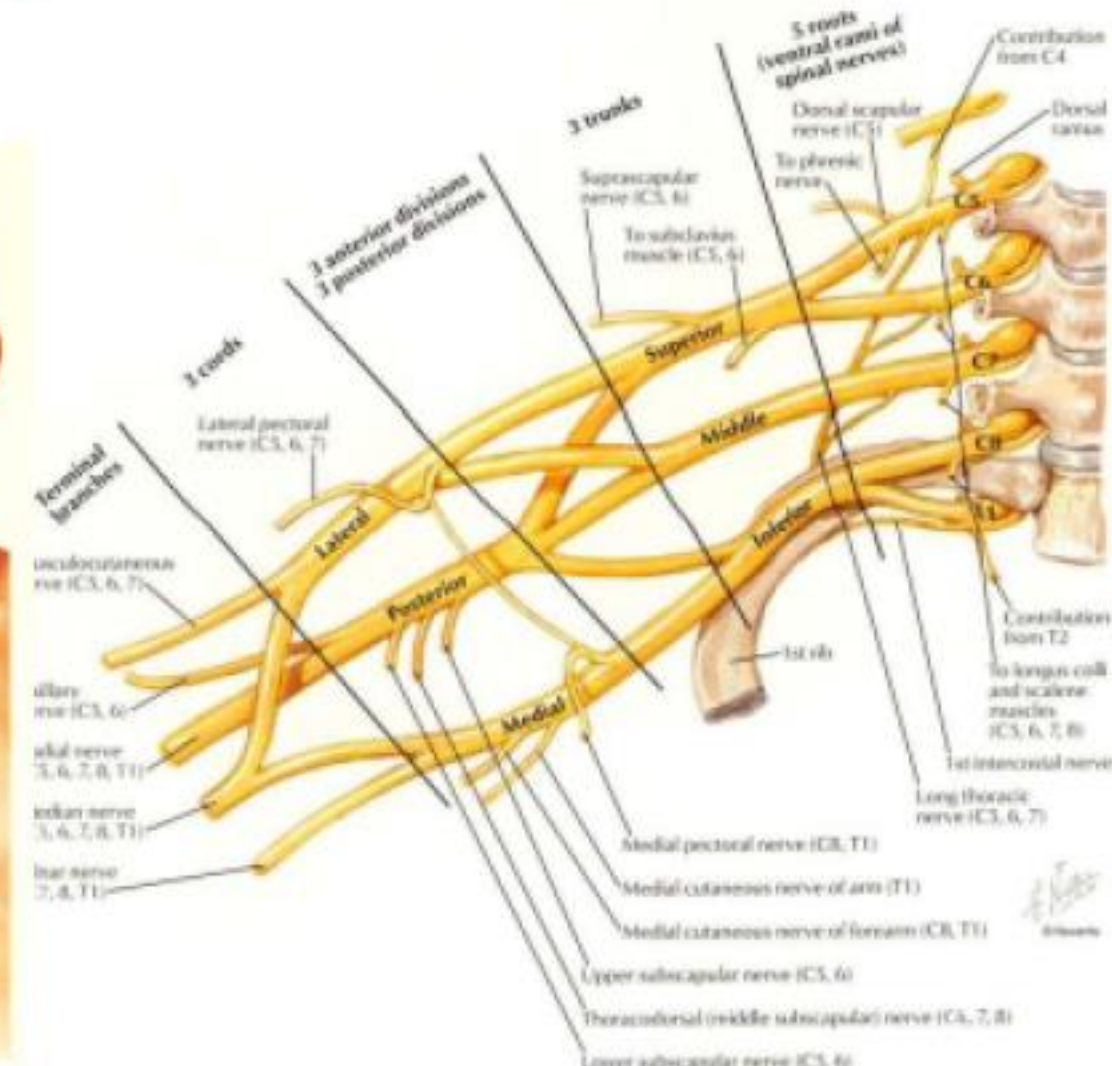
"claw hand"

From Moore & Dalley (1999)

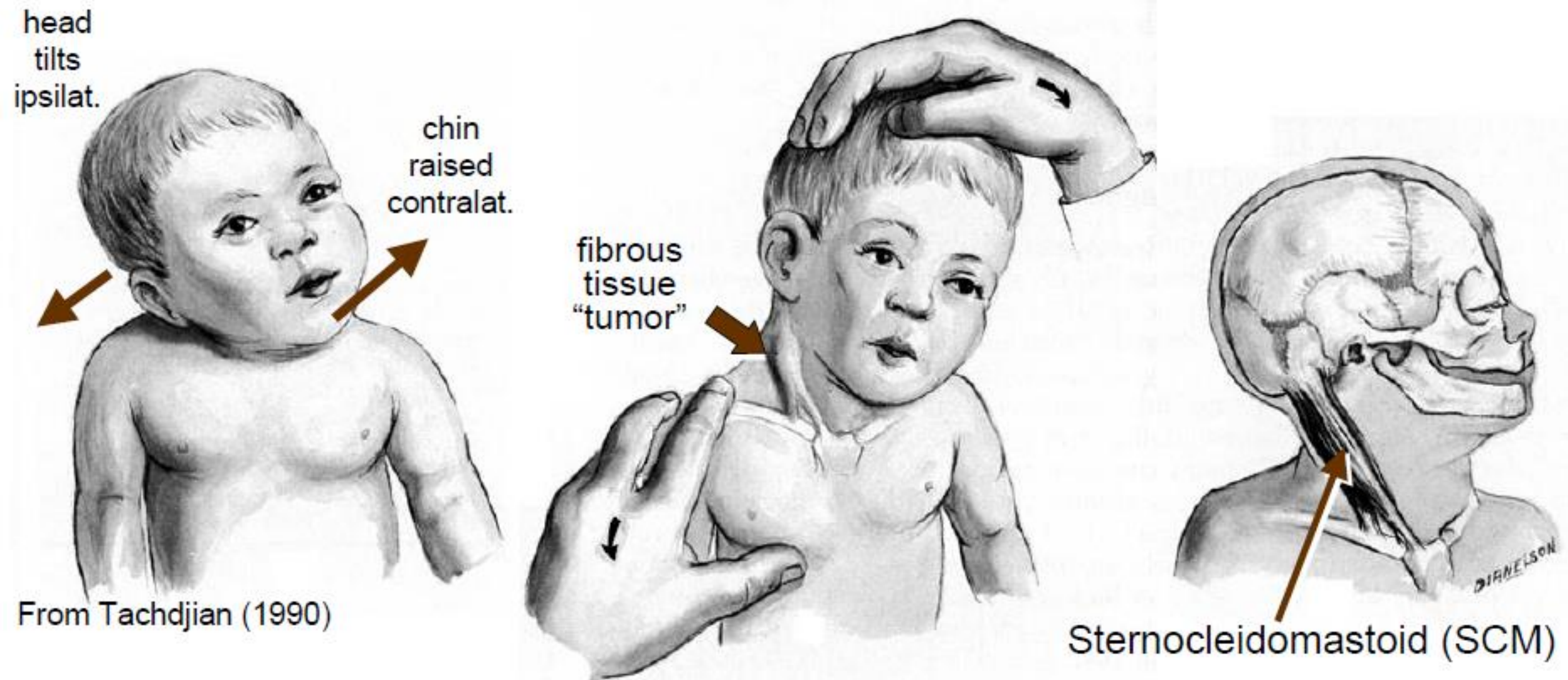
- Much rarer than UBPIs and Erb's Palsy
- Loss of C8 & T1 results in major motor deficits in the muscles working the hand: "claw hand"
- Loss of sensation to medial aspect of upper extremity



Anterior view



Congenital Muscular Torticollis



- Fibromatosis colli that develops in SCM probably prior to birth, although birth trauma (e.g., forceps) has also been implicated
- 75% of cases on right side
- SCM is transformed into a cordlike, nonfunctional muscle, distorting head and neck posture and altering growth of the face
- Etiology is unclear: Arterial or venous obstruction? Intrauterine malposition?



